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DAIRY-HERD TESTING IN NEW ZEALAND.

REVIEW OF 1924–25 SEASON.

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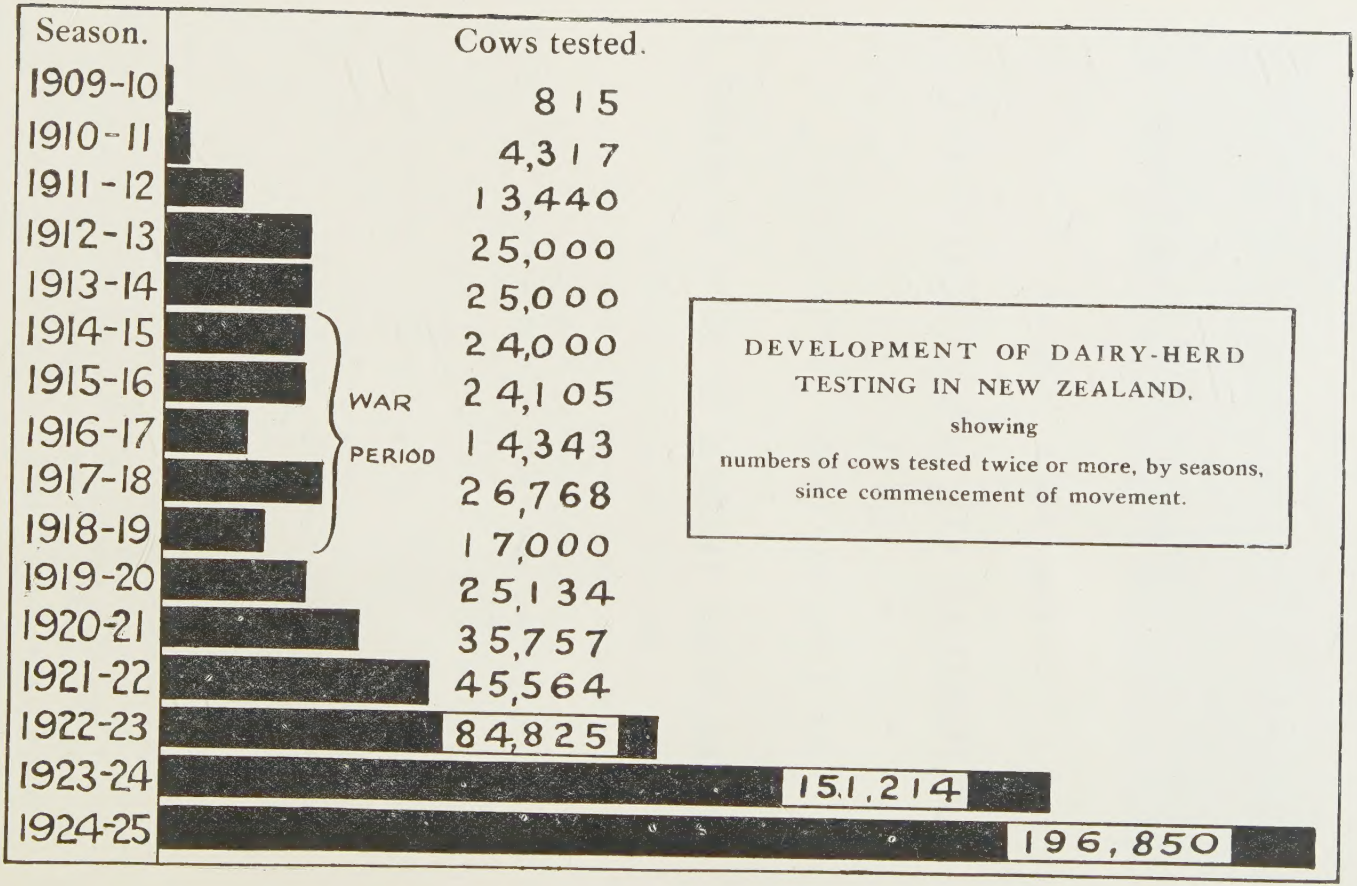
EXTENT AND SYSTEMS OF TESTING.

DAIRY-HERD testing in the Dominion has again shown a substantial increase in the number of cows under test. The figures for 1924–25, on the basis of all cows tested twice or more, give a total of 196,850, as against 151,214 for the preceding season. This increase of 45,636 cows slightly exceeds the total number tested four years ago, during the 1921–22 season. In order to enable readers to see at a glance the progress made since the inauguration of the first testing association at Dalefield in 1909 the accompanying graph has been prepared (see next page). The group of years bracketed covers the period of the Great War, and for obvious reasons should be neglected when considering the progress of the movement. Of late years the popularity of the "Group" system has acted as a stimulus to herd-testing, and has helped in the breaking of much new ground. Dairymen now appear to be fully aware of the necessity of herd-testing, and so long as the movement extends as it has done in recent years we have every reason to feel confident that great improvement will eventually be effected in the average yield of our dairy stock.

Herd-testing in New Zealand is conducted under practically three distinct systems—namely, "Association," "Group," and "Dairy Company." In the Association system the members do their own


Season.
Cows tested.
1909-10
815
1910-11
4,317
1911-12
13,440
1912-13
25,000
1913-14
25,000
1914-15
24,000
1915-16
24,105
1916-17
14,343
1917-18
26,768
1918-19
17,000
1919-20
25,134
1920-21
35,757
1921-22
45,564
1922-23
84,825
1923-24
151,214
1924-25
196,850
WAR PERIOD
DEVELOPMENT OF DAIRY-HERD TESTING IN NEW ZEALAND,
showing
numbers of cows tested twice or more, by seasons, since commencement of movement.

weighing and sampling for as many of their cows as they please for two out of every thirty days. The samples are sent to a depot to be tested by the testing officer. In the Group system a testing officer visits the farms once a month, weighs and samples milk for each cow for twenty-four hours, and tests the samples. For the Association system figuring may be done by the secretary of the association or his staff, the testing officer, the secretary of the dairy company or his staff, the factory-manager, or, in the case of what are known as "Government" associations, by officers of the Dairy Division field or headquarters staff. Figuring of returns for the Group system is usually done either by the secretary of the association, his staff, or the testing officer. Testing under the Dairy Company method follows the Association system, except that the testing is always done by the factory-manager, and figuring is left to the farmers themselves. No association is formed, and generally no charge is made for the testing. Government associations are conducted entirely under the Association system, and quite often have no formed association. The members give authority to the dairy company to deduct from their payments the amount of fees due to the Dairy Division, and thus are held together to this extent.

These points having been made clear, the number of cows tested twice or more for the past three seasons, grouped according to the three systems outlined, may be presented in the following table:—

Table 1.—Numbers of Cows tested Twice or more, grouped according to Season and System of Testing.

System.	1922–23.			1923–24.			1924–25.		
	Number of Associations, &c.	Number of Cows.	Average Cows per Association, &c.	Number of Associations, &c.	Number of Cows.	Average Cows per Association, &c.	Number of Associations, &c.	Number of Cows.	Average Cows per Association, &c.
Association ..	90	67,835	754	114	96,198	844	117	87,695	750
Group ..	6	7,500	1,250	34	43,144	1,269	91	100,055	1,100
Dairy Company	46	9,490	206	42	11,872	283	51	9,100	178
All ..	142	84,825	597	190	151,214	796	259	196,850	760

Group testing has shown great increases, and it must be borne in mind that the season 1922–23 was the first year of its inception. The Association system proper has shown a small decrease for the past season, due to some of the groups absorbing some of the association members in thickly settled districts; while the Dairy Company system has remained fairly constant for the three years. The average number of cows per association under all types shows a peak in 1923–24, and it is thought that the slight falling-off for last season is partly due to associations opening up in more outlying and scattered districts than formerly.

Table 2.—Number of Cows tested Twice or more, grouped according to Year and Land Districts, &c.

Land District.	1922–23.			1923–24.			1924–25.		
	Total Cows in Milk.	Cows tested Twice or more.	Percentage.	Total Cows in Milk.	Cows tested Twice or more.	Percentage.	Total Cows in Milk.	Cows tested Twice or more.	Percentage.
North Auckland	164,993	17,973	10·9	174,965	23,521	13·4	180,039	31,049	17·7
Auckland ..	266,054	32,123	12·1	288,903	63,945	22·1	300,149	93,912	32·5
Gisborne ..	23,821	2,419	10·2	26,328	3,122	11·9	26,955	4,022	14·9
Hawke's Bay ..	43,720	1,629	3·7	46,880	4,391	9·4	48,689	5,468	11·2
Taranaki ..	187,818	15,585	8·3	192,220	18,567	9·7	193,414	16,840	8·7
Wellington ..	175,483	12,534	7·1	184,450	30,584	16·6	185,597	37,415	20·2
North Island ..	861,889	82,263	9·5	913,746	144,130	15·8	934,843	188,706	20·7
South Island ..	262,782	2,562	1·0	271,231	7,084	2·6	260,724	8,144	3·1
Dominion ..	1,124,671	84,825	7·5	1,184,977	151,214	12·8	1,195,567	196,850	16·5

In order to follow the trend of increase in herd-testing for the various districts during the past three seasons Table 2 has been compiled. The percentages indicated are on the basis of all cows in milk only, and not for all cows in milk and dry. The number of cows in milk are given as at 31st January of each year, and are those compiled by the Government Statistician. If a cow is indicated as dry at this period of the year it is doubtful if she would be included in the number of cows tested. It will be noticed from the table that for the whole of New Zealand the percentage of cows tested has risen steadily, despite the continual increase in the total cows in milk, till it now stands at 16·5 per cent. This means that, roughly, one cow out of every six available for testing was tested during the past season. This is very creditable when it is considered that the total number of cows in milk has risen 6·3 per cent. from 1922–23. The North Island tested one cow out of every five, and has shown good increases every year. The South Island, although it has shown steady increase, tested only 3·1 per cent. of its total available cows, and leaves room for much extension in the movement. We understand, however, that in one district at least of the South Island this position will be rectified during the present season.

AVERAGE YIELD OF TESTED COWS.

Much useful information may be gleaned by summarizing all association results, and the necessity for these to be made available for this purpose must be stressed. The Dairy Division during the last three years has made every effort to collect annual summaries of production from all testing associations operating in the Dominion.

In 1922–23 annual summaries received represented 76 per cent. of the total number of cows tested other than under the Dairy Company system; in 1923–24 this percentage rose to 92 per cent.; and for 1924–25 it stands at 91 per cent. We take this opportunity of thanking all those who supplied annual summaries of results.

From annual summaries received for the 1924–25 season 151,875 cows altogether are represented in the averages, as against 107,777 for 1923–24 and 50,753 for 1922–23. Table 3 gives the numbers of cows, herds, and associations represented in the summaries received for the past two seasons. The other figures give the average size of herds and associations. Table 4 gives similar information according to the system of testing adopted.

Table 3.—Cows, Herds, and Associations represented in Season's Summaries received.

—	1923–24.	1924–25.
Number of associations	140	190
Number of herds	3,837	4,815
Number of cows	107,777	151,875
Average number of herds per association	27	25
Average number of cows per herd	28	32
Average number of cows per association	770	799

Table 4.—Average Size of Associations for which Season's Summaries were received, according to System adopted, and on Basis of all Cows in Milk 100 Days or more.

System.	Season.	Herds per Association.	Cows per Association.	Cows per Herd.
Association	1923–24	28	641	23
Association	1924–25	25	574	23
Group	1923–24	25	1,203	48
Group	1924–25	26	1,185	45

Table 5 supplies the grand summary of all association-testing results available for the past two seasons. Figures are given on the basis of all cows in milk 100 days or more. The average production shown in a similar table for 1922–23 was 233·71 lb. fat in 225 days. The past season's figures show about 10·5 lb. butterfat increase over 1923–24, but are about 10 lb. below 1922–23.

Table 5.—Grand Summary of all Association-testing Results available for Last Two Seasons.

—	1923–24.		1924–25.	
	Days in Milk.	Pounds Butterfat.	Days in Milk.	Pounds Butterfat.
Average of all cows (107,777 in 1923–24 and 151,875 in 1924–25)	230	213·010	229	223·54
Highest association average	255	302·86	259	319·78
Lowest association average	175	140·16	169	154·13
Highest herd average	301	585·76	308	442·25
Lowest herd average	120	57·25	130	38·78
Highest cow	300	780·12	365	870·07
Lowest cow	109	18·23	223	28·61
Average daily production of butterfat for all cows	..	0·93	..	0·98

The effect of nature of season experienced must be given due consideration, and true comparison of one season's results with another's will remain difficult unless some coefficient can be arrived at from which it will be possible to standardize all annual results to the common basis of an average season. It is unreasonable also to expect much increase in the average yield of all association-tested cows so long as the number of cows under test is increasing so much each year and naturally includes more and more unproved animals. It is generally the more progressive dairymen who first take up systematic testing, and men who as a rule have better producing cows than others in their district. When eventually the less progressive dairymen join up with associations the advance in average production which would otherwise have been shown is lost in counterbalancing the effect of the poorer herds of these new members. It is therefore very encouraging to see that average association production has been so well maintained for the past three seasons.

Another point which needs consideration is the difference in conditions between the two main systems of testing—Association and Group. As mentioned previously, many very poor cows are not continued for as much as a hundred days under the Association system, whereas under the Group system the member has little option.

Then again, groups continue for a longer average number of days for much the same reason. To exemplify this latter statement it may be stated that all associations under the Association system last year averaged 221 days in milk, while for all Group associations the average was 235 days. Now, on an average, cows are producing about ½ lb. of butterfat per day at this stage, so that the Association average should be raised by about 7 lb. of butterfat to put it on a Group basis. The average Association yields have been estimated on a Group basis for all records available for the past three years, and are as follows: 1922–23, 237 days, 239·32 lb. fat; 1923–24, 237 days, 216·54 lb. fat; and 1924–25, 235 days, 226·72 lb. fat. The Division has made a practice of running out annual summaries for those associations which are tested by their officers on the basis of all cows in milk 210 days or more. Summaries on this basis give a better idea of the average production for dairy cows, for the reason that it eliminates those records where cows may have died, fallen sick, or have been sold or discontinued by members for reasons of their own early in the testing season. The difference between the summaries on the basis of 100 and 210 days is clearly shown in the following table:—

Table 6.—Average Production for Associations conducted by Officers of the Dairy Division, comparing Difference in Production between Results of Summaries compiled on the Basis of all Cows in Milk 100 Days or more and 210 Days or more.

Year.	100 Days.		210 Days.	
	Average Days.	Average Butterfat.	Average Days.	Average Butterfat.
1922–23	227	232·99	261	271·48
1923–24	227	221·39	258	267·10
1924–25	223	231·51	258	266·29

Now we may raise the estimated average production figures for all cows on the Group method to estimate average production on the Group basis for 210 days. The results are as follows: 1922–23, 272 days, 278·86 lb. fat; 1923–24, 269 days, 261·25 lb. fat; and 1924–25, 272 days, 260·78 lb. fat. These figures should act as a fairly reliable guide to the average production for all cows tested and for which long enough records are available. At the same time it is considered that the final results (were they available) would show a few pounds increase on these again. It has been our experience that only a small proportion of members give the drying-off dates for all cows, or even test long enough. Besides, late calvers, or cows continuing for longer periods than the average, are not given full credit, for the reason that all associations close down for the winter. In some districts members who supply milk to dairies for town consumption have cows running through from

Table 7.—Average Production, according to Land Districts, for all Association-tested Cows in Milk 100 Days and over for which Season's Summaries were obtained.

Land District.	1922–23.				1923–24.				1924–25.			
	Average Days.	Average Fat.	Cows in Summary.	Percentage of Total Cows in Milk.	Average Days.	Average Fat.	Cows in Summary.	Percentage of Total Cows in Milk.	Average Days.	Average Fat.	Cows in Summary.	Percentage of Total Cows in Milk.
North Auckland ..	215	214·63	11,117	6·7	219	200·23	16,270	9·3	216	205·14	25,685	14·3
Auckland	219	226·75	15,184	5·7	234	207·86	48,253	16·7	235	224·98	77,003	25·7
Gisborne	222	220·08	1,852	7·8	209	202·16	2,026	7·7	204	208·34	3,455	12·8
Hawke's Bay	234	251·62	1,072	2·5	231	228·34	1,790	3·8	243	233·25	4,575	9·4
Taranaki	238	263·27	12,565	6·7	233	246·66	13,377	7·0	233	251·58	11,683	6·0
Wellington	236	229·98	7,817	4·5	237	215·60	22,402	12·1	228	230·99	24,199	13·0
North Island	226	234·08	49,607	5·8	232	213·56	104,118	11·4	230	224·48	146,600	15·7
South Island	208	217·76	1,146	0·4	194	197·47	3,659	1·3	197	197·36	5,275	2·0
Dominion	225	233·71	50,753	4·5	230	213·01	107,777	9·1	229	223·54	151,875	12·7

one season to another, and cause overlap in the association testing season, and for the above-mentioned reason miss a few important periods of testing. For these reasons the association average may be taken as being on the conservative side.

In order to compare the average association production in the various districts over the past three years Table 7 is presented. The most striking point is that the six land districts of the North Island, despite considerable variation in the seasons experienced, have maintained the same order for height of production.

INCIDENCE OF CULLING.

Table 8 gives the Government Statistician's figures for the totals of dairy cows in milk, cows dry, and cows in milk and dry for the various land districts for the past three years as at 31st January of each year. Table 9 gives the percentages for these figures on the basis of the preceding year. From the tables it will be seen that, with the exception of the South Island, considerable increase has taken place for all districts in the numbers of cows in milk and cows in milk and dry. In regard to the numbers of dry cows, it will be noticed that Auckland and Taranaki show decreases. Cows dry at the period of the year to which these figures apply may be expected to be comprised of cows normally dry (winter calvers) and cows dry because of disease—in particular, contagious mammitis and abortion—also "dud" animals. One would expect the ratio between the numbers of cows in milk and cows dry to keep much the same year by year, provided neither class included undesirables of this sort. It appears, therefore, that Taranaki and Auckland are weeding out from the dry class at least. Table 10 gives the totals and percentages of the slaughterings at meat-works and abattoirs year by year for bullocks and heifers, cows, and total cattle. The figures were supplied by the Live-stock Division.

Slaughterings have varied year by year for all classes, and much of this variation is due to fluctuations in the price of beef. A minimum was reached in 1921–22, this being mainly due to the slump in prices immediately preceding and obtaining at that time. It will be noticed, however, that slaughterings of cows have increased since this period to a considerable extent, until for 1924–25 they are, roughly, 7 per cent. higher than for any of the previous years. When the slump came many fat-stock raisers turned to dairying for a few years until better prices ruled. Many of the cows used for this purpose were undoubtedly of beef type, as shown in Table 11.

This turnover of beef cows to the dairy class and then back again caused much of the fluctuation shown, and the effect on the percentage of dry to all dairy cows is obvious.* Reverting to Table 10, it is now evident what happened to many of the cows not killed during the slump period. During that period the killings of bullocks and heifers did not fall off as much as those of cows. However, any accumulation which did occur was dispensed with in 1923–24, for the number of bullocks

* Some of this diversion of beef cows to dairy purposes was due, of course, to the high prices obtaining for butterfat during the years 1918, 1919 1920, and 1921. It must be borne in mind, however, that a severe slump in the price of butterfat occurred in 1922, and it was about this time, although both beef-raising and the dairy industry were at a slump, that dairying appeared to be the better proposition of the two.

Table 8.—Number of Dairy Cows in New Zealand (including Boroughs).

Land District.	31st January, 1923.			31st January, 1924.			31st January, 1925.		
	Cows in Milk.	Cows Dry.	All Cows.	Cows in Milk.	Cows Dry.	All Cows.	Cows in Milk.	Cows Dry.	All Cows.
North Auckland	164,993	20,883	185,876	174,965	22,359	197,324	180,039	24,318	204,357
Auckland	266,054	26,466	292,520	288,903	25,174	314,077	300,149	24,092	324,241
Gisborne	23,821	3,427	27,248	26,328	4,633	30,961	26,955	4,737	31,692
Hawke's Bay	43,720	6,641	50,361	46,880	7,353	54,233	48,689	7,985	56,674
Taranaki	187,818	13,940	201,758	192,220	11,340	203,560	193,414	10,612	204,026
Wellington	175,483	18,332	193,815	184,450	20,195	204,645	185,597	19,809	205,406
North Island	861,889	89,689	951,578	913,746	91,054	1,004,800	934,843	91,553	1,026,396
South Island	262,782	34,283	297,065	271,231	36,558	307,789	260,724	36,312	297,036
Dominion	1,124,671	123,972	1,248,643	1,184,977	127,612	1,312,589	1,195,567	127,865	1,323,432

Table 9.—Increases or Decreases for Cows in Milk, Cows Dry, and all Cows (Supplementary to Table 8).

Land District.	1924 Figures expressed as Percentages of 1923 Figures.			1925 Figures expressed as Percentages of 1924 Figures.		
	Cows in Milk.	Cows Dry.	All Cows.	Cows in Milk.	Cows Dry.	All Cows.
North Auckland	106·0	107·1	106·2	102·9	108·8	103·6
Auckland	108·6	95·1	107·4	103·9	95·7	103·2
Gisborne	110·5	135·2	113·6	102·4	102·2	103.2
Hawke's Bay	107·2	110·7	107·7	103·9	108·6	104·5
Taranaki	102·3	81·3	100·9	100·6	93·6	100·2
Wellington	105·1	110·2	105·6	100·6	98·1	100·4
North Island	106·0	101·5	105·6	102·3	100·5	102·1
South Island	103·2	106·6	103·6	96·1	99·3	96·5
Dominion	105·4	102·9	105·1	100·9	100·2	100·8

and heifers killed in 1924–25 shows a considerable decrease. More cows are now being killed, and it seems hardly likely that this is solely due to a hold-over, for in that case such cows would in all probability have been disposed of at much the same time as held-over bullocks and heifers. It therefore appears that a considerable number of these extra cows must be cull dairy cows.

Table 10.—Numbers and Percentages of Cattle slaughtered at Meat-works and Abattoirs.

Year ended 31st March.	Bullocks and Heifers.	Percentage of Total.	Cows.	Percentage of Total.	Total Cattle.
1917	176,102	53·6	139,315	42·4	328,708
1918	163,021	56·2	115,473	39·8	290,150
1919	184,696	60·0	109,501	35·6	307,816
1920	217,595	60·6	125,632	35·0	359,173
1921	195,751	64·1	99,759	32·7	305,363
1922	141,607	69·1	55,652	27·1	204,987
1923	189,737	67·4	76,514	27·2	281,364
1924	195,210	59·4	118,032	35·9	328,809
1925	179,528	45·2	197,328	49·6	397,432

Table 11.—Increases in the Number of Dairy Cows compared with Increases or Decreases of Total Cattle other than Dairy Cattle.

("Total cattle other than dairy cattle" includes calves, but excludes stud bulls. Each year's figures are expressed as percentages of the preceding year, except in the case of dry dairy cows, which are expressed as percentages of the total dairy cows in milk and dry for the same years.)

Year (as at 31st January).	Dairy Cows in Milk and Dry.	Total Cattle other than Dairy.	Dry Dairy Cows.
1918	102·0	115·8	10·4
1919	104·1	106·3	11·3
1920	108·1	99·8	12·3
1921	112·4	96·4	11·3
1922	113·1	102·4	10·7
1923	109·8	102·1	9·9
1924	105·1	100·9	9·7
1925	100·8	96·7	9·6

CONCLUSION.

The foregoing review indicates that the present position of herd-testing is very satisfactory, and that the movement is now receiving the serious attention of most dairy-farmers. Not only are large increases being made in the number of cows tested year by year, but the average yield is also being well maintained. As long as increased numbers of new cows are being tested each year no advance in the average yield of all tested cows may show itself, but this is no reason why it should be assumed that no improvement is being effected in that respect.

The writer desires to acknowledge the co-operation of Mr. W. N. Paton, of the Dairy Division headquarters staff, in the preparation of this article.

NOTES ON SOME MANURIAL EXPERIMENTS IN CANTERBURY AND OTAGO.

(Concluded.)

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THE trials here summarized are a continuation of those published in the *Journal* for January, 1925. The source of information is the same, and the calculations have been made by the same methods. The writers are indebted for assistance to Mr. W. C. Purdie, of Marlborough College, Blenheim, who calculated the averages and errors of the wheat trials, and many students of Lincoln College have contributed to the results by working out parts of the tables during their study of the methods of making and interpreting agricultural experiments.

SWEDE MANURIAL TRIALS.

These were conducted by the Department of Agriculture on four farms in Canterbury and twenty-seven in Otago during the years 1911–16. In every case considered six plots were tried on the same farm, every series containing one unmanured plot, one with 1½ cwt. super, and so on. The results are given in tons per acre of roots alone, and the computation of odds in favour of significance of the results is calculated by the method known as "Student's." Each plot is differenced against the 1½ cwt. super plot on the same farm and year, since that manuring may be considered standard practice. Mixture No. 5 (potash), however, is contrasted with manure on Plot 4 for a reason obvious on examination. Owing to the weighings of one of the pairs being absent in numerous cases it is not always the same twenty or thirty plots that are used as the standard. For instance, Plots 1 to 25 may be used in one case, and Plots 5 to 30 in another, but the comparison is always between plots on the same farm and in the same year.

Table 1.—Swede Manurial Trials.

Series No.	Manure.	Number of Trials.	Yield in Tons per Acre.	Yield of Corresponding Plots of 1½ cwt. Super.	Gain or Loss in Tons.	Odds in Favour of Significance.
1	No manure ..	28	15·5	27·9	−12·4	Thousands to 1.
2	2 cwt. guano ..	17	25·6	23·8	+ 1·8	20 to 1.
3	3 cwt. super ..	28	27·0	25·8	+ 1·2	6 to 1.
4	2 cwt. super + ½ cwt. or ¾ cwt. bonedust	27	29·4	26·7	+ 2·7	Hundreds to 1.
5	No. 4 + ¼ cwt. sulphate of potash	18	29·1	29·4 (Yield of No. 4)	− 0·3	Odds against.

There is no doubt a loss through using no manure. Each of the other manures gives some gain over 1½ cwt. super, though the gains due to 2 cwt. guano or 3 cwt. super are not sufficiently certain to allow these manures to be recommended without further trial. The case of 2 cwt. super plus ½ cwt. or ¾ cwt. bonedust, however, is on a very different footing, for this mixture gives a gain of 2·7 tons over 1½ cwt. super, and the high figure assigned to the probability of the significance of the result indicates that the advantage was obvious in the great majority of the trials.

Taken as a whole, the results of the various manures on the swedes have been of the same nature as on the turnips, but the heavier dressings and the slower-acting manures have naturally been more effective.

Table 2.—Comparison of Results of the Same Manures on Turnips (see Journal, *January, 1925) and Swedes.*

Series No.	Manure.	Gain or Loss on 1½ cwt. Super.	
		Turnips.	Swedes.
1	No manure	9·0 tons loss ..	12·4 tons loss.
2	2 cwt. guano	1·2 tons loss ..	1·8 tons gain.
3	3 cwt. super	0·6 tons gain ..	1·2 tons gain.
4	2 cwt. super + ¾ cwt. bonedust	1·0 tons gain ..	2·7 tons gain.
5	No. 4 + ¼ cwt. sulphate of potash	0·1 tons loss on No.	0·3 tons loss on No. 4.

No manure causes a greater loss in the swedes than in the turnips, because the crop as a whole is a heavier one. 3 cwt. super gives a better result in the swedes, because swedes are usually grown in districts with damper climatic conditions than turnips, and so the greater quantity of manure is brought into solution. Guano, and bonedust added to super, give a better result with swedes, because the crop is longer in the ground than turnips, and so the slow-acting manures have time to become available. The two series of trials thus support each other, and give a very clear indication that for Otago conditions the best manure so far experimented with is something of the nature of 2 cwt. per acre of super plus ½ cwt. or ¾ cwt. of a slow-acting phosphate such as guano or bonedust. The high probability of the significance of the result in the case of swedes makes this conclusion specially worthy of note.

It is each farmer's business to determine whether, under the circumstances in which he is placed, the expenditure on an additional ½ cwt. super and ½ cwt. or ¾ cwt. of bonedust or guano is justified by a return of about 1 ton of turnips or about 2½ tons of swedes.

It is important to note that in neither set of experiments did potash give the slightest result.

POTATO MANURIAL TRIALS.

These were conducted on thirty-three farms in Canterbury and Otago during the years 1911–16. Each manured plot was compared with an unmanured plot adjacent to it.

Table 3.—Potato Manurial Trials.

Series No.	Manure.	Number of Trials.	Yield in Tons per Acre.	
1	No manure	18	8.0	
2	2½ cwt. super	19	9·5	See text below.
3	2 cwt. super + 1½ cwt. bonedust	18	9·2	
4	2 cwt. super + ½ cwt. bonedust	18	10·1	
5	2 cwt. super + 1½ cwt. bonedust + 1½ cwt. blood	18	9·9	
6	2⅔ cwt. super + 1⅞ cwt. bonedust + 1⅞ cwt. blood	19	10·4	
7	2 cwt. super + 1½ cwt. bonedust + ¾ cwt. sulphate of ammonia + 1 cwt. potash	18	9·8	
8	2 cwt. super + 1½ cwt. bonedust + 1½ cwt. blood + 1 cwt. sulphate of potash	18	9·6	
9	2 cwt. super + ½ cwt. bonedust + 1½ cwt. blood + ½ cwt. sulphate of potash	18	9·8	

All the manured plots show an increase over the unmanured ones, but the unavoidable errors in the experiment are such as to make of no significance the differences between the figures bracketed together. The average increase due to manure is 1¾ tons per acre, and there is therefore no doubt that manuring pays. The figures, however, give no indication which manure gives the highest yield.

A series of plots, not included in the table, manured with 4 cwt. super yielded only 8·5 tons per acre. The range in the results was, however, so great as to leave it inconclusive whether this represents a real diminution on the 2½-cwt.-super yield, or one due only to error in experiment. The figure is suggestive, not conclusive.

Comparing plots with and without potash, it is evident that no significant increase has been obtained by the use of this manure.

After a critical examination of the figures on which the table is based it is found that the following conclusions may safely be drawn: (1.) There is a certainty of increase in yield by manuring. (2.) There is no indication which manure gives the best result. The non-significance of the differences between various manures is emphasized by a comparison of the results from Series 3 and 4, or from Series 5 and 6. (3.) Since there is no indication from the experiments that the more expensive manures give higher yields, the cheapest manure—namely, super—is the best to use, unless local experience, or until more elaborate experiments, prove otherwise.

MANGOLD MANURIAL TRIALS.

These trials were conducted on about equal numbers of farms in Canterbury and Otago—in all nineteen—during the seasons 1911–16. The same method of treating the results was followed as in the trials previously dealt with, and always a manured plot was compared with an unmanured one adjacent to it. In addition the effect of adding in turn each fertilizing constituent—for example, potash, salt, guano, and blood—was determined.

Table 4.—Mangold Manurial Trials.

Series No.	Manure.	Number of Trials.	Yield in Tons per Acre.
1	Unmanured	19	31·0
2	2 cwt. super	19	40·4
3	No. 2 + 1 cwt. guano	19	41·8
4	No. 3 + 1 cwt. sulphate of potash	19	42·4
5	No. 4 + 1 cwt. salt	19	41·9
6	No. 5 + 1 cwt. blood	19	40·3
7	40 cwt. lime	17	35·7

(See text below.)

There is here an increase of yield due to manuring, but the unavoidable errors in the experiment are such as to make of no significance the differences between the figures bracketed together.

For the Taranaki, Wanganui, and Feilding districts, Deem (this *Journal*, Oct., 1923, p. 225) finds that a liberal dressing of phosphatic manures produces the best crops. This conclusion is supported by the figures in the foregoing table. The average increase is about 10 tons per acre by manuring with any of the mixtures given. It appears that super would be the least expensive manure to use to secure this increase, and there is little doubt that this manuring is a payable one.

In view of the common practice of applying salt and potash in special mangold-manures, it is interesting to note that there is no significant increase in yield when these constituents are added.

Plots manured with 40 cwt. lime alone gave a significant increase of about 5 tons per acre.

The result of a critical examination of the figures allows the following conclusions to be drawn with safety: (1.) There is a certainty of increase in yield by manuring. (2.) There is no indication from the experiments which manure gives the best results. (3.) In the meantime super is the most economical manure to use.

WHEAT MANURIAL TRIALS.

As mentioned in the introduction, we are indebted to W. C. Purdie for working out the results of these trials. They were conducted on nineteen farms in Canterbury and Otago, and all comparisons are from trials on the same farm and in the same year.

Table 5.—Wheat Manurial Trials.

Series No.	Manure.	Number of Trials.	Yield in Bushels per Acre.
1	No manure	15	35·6
2	Super, ½ cwt.; gypsum, 1 cwt.	12	34·3
3	Super, 1½ cwt.	12	41·6
4	Super, 1 cwt.; bonedust, ½ cwt.	14	37·7
5	Super, 1 cwt.; gypsum, ½ cwt.	15	40·9
6	Super, 1 cwt.; gypsum, ¼ cwt.; potash, ¼ cwt. ..	14	36·7

(See text.)

Fourteen other manurial mixtures were tried on wheat, but none of them was used on more than five plots, and so their figures have not been considered.

No definite conclusion can be drawn from the figures presented. The considerable increase shown in the superphosphate series is at first sight very attractive, but about half the increase is due to one trial, where super gave 41 bushels per acre more than the adjacent unmanured plot. Such a record reduces the reliability of the result, and this is expressed in the high probable error, which, in the complete tables, will be found attached to the increase here shown. Similar abnormal variations give a high probable error to the result shown for Series No. 5, so that one is not able to say with certainty that the manuring has given an increased yield. On the contrary, the odds in favour of a real increase from the use of 1½ cwt. super prove to be 16 to 1—sufficient to indicate that this manure is well worth a further trial. If Series 2 and 3 are compared it is found that the increased yield from 1½ cwt. super over ½ cwt. super is a real one (odds 40 to 1 in favour of significance), and this is another indication of promise from further trials of super on wheat.

Most readers will be aware that such further trials have already been made by Mr. M. J. Scott, of Lincoln College, and by Messrs. Ward and Hudson, of the Department of Agriculture (see this *Journal* for April last). The modern methods used have secured very much more rapid and conclusive results than were possible with the older style of experiments here analysed, and it is now certain that manuring with 1 cwt. of super will increase the yield of wheat by about 7 bushels per acre on certain land near Christchurch. The recent experiments, similarly to the older ones, give no indication of economic utility in the more expensive manures.

The chief value of the whole series of trials here summarized—those on turnips, mangolds, &c., as well as those on wheat—is to indicate what experiments are likely to give rapid and conclusive results in the hands of present day workers.

OAT MANURIAL TRIALS.

Nineteen different manurial mixtures were used on oats, but, unfortunately, most of them were used in only a few cases. Inspection of the figures shows that the majority of the trials could yield no definite information, and so only those that were tried most frequently have had their results worked out. The trials recorded were made on eleven farms (six in Canterbury and five in Otago) during the season 1911–12.

Table 6.—Oat Manurial Trials.

Series No.	Manure.	Number of Trials.	Yield in Bushels per Acre.	
1	No manure	11	62·8	
2	Super, 1 cwt.	11	70·0	See text.
3	Super, 1 cwt. + nitrate of soda, ¼ cwt. + gypsum, ¼ cwt.	11	70·4	
4	Super, 1 cwt. + sulphate of potash, ¼ cwt. + gypsum, ¼ cwt.	11	71·8	

There is a significant increase, beyond the limits of experimental error, in the case of each manure tried, but the differences between the various manures are due merely to the conditions of the experiment It can safely be said that the increase in each case is due to the super rather than to the nitrate or potash.

The marked result from manures on oats, compared with that obtained from wheat, is probably due to the better place in the rotation given to wheat. Where both cereals are grown, wheat comes after grass or after rape, when noticeable quantities of available plant-foods are present in the soil. Oats, on the other hand, usually come after wheat, when the accumulated store of reserve foods has been used up, and therefore the crop responds well to the available food artificially supplied.

CONCLUSION.

This completes the summarizing of the South Island co-operative manurial trials for the years 1911–16. Their chief value is (1) to indicate promising lines for future investigation, and (2) to demonstrate the overwhelming importance of phosphatic manures on every kind of farm crop, and the absence of apparent effect of potash and such nitrogenous fertilizers as were tried on all the crops dealt with.

Tables and calculations will be published separately.

A NEW JERSEY CHAMPION—HOLLY OAK'S ANNIE.

THE performance under certificate-of-record test of the Jersey cow Holly Oak's Annie, completed on 28th September, marks a new record for the breed in New Zealand, surpassing the yield of the previous champion, Vivandiere, by some 20 lb. of butterfat. Holly Oak's Annie was bred by Mr. John Hale, of New Plymouth, and was first purchased by Messrs. H. H. Sutton and Co., of Longbush, Masterton, who tested her during the 1921–22 season, when, as a junior two-year-old, she gained a C.O.R. for 586·06 lb. butterfat. The outstanding record just completed, however, was made on the farm of her present owner, Mr. W. T. Williams, Pukehou, Hawke's Bay. Commencing at the age of five years and nine days, Holly Oak's Annie yielded in 365 days 18,522·7 lb. milk containing 1,056·49 lb. butterfat—a New Zealand Jersey record for both milk and butterfat. Holly Oak's Annie has yet to complete her requirements for C.O.R by calving subsequent to test. It is expected that she will calve about 20th November, which will be a month or so within the period for a first-class certificate permitted by the C.O.R. rules. Congratulations are extended to Mr. John Hale, breeder of the new champion, and to Mr. W. T. Williams, who enabled her to use to such advantage the productive ability which she so evidently possesses.

—W. M. Singleton, Director of the Dairy Division.

FAT-LAMB RAISING.

AN OUTLINE OF NEW ZEALAND METHODS

Live-stock Division.

THE breeds of sheep used in the production of fat lambs for the New Zealand meat-export trade vary in accordance with the physical conditions and different qualities of soil in the various districts. The lamb most favoured for the trade is the product of the half-bred Merino high-country station ewe crossed with a Southdown, Shropshire Down, or Hampshire Down ram (the Southdown being most largely used), or the progeny of a Southdown ram from Romney, Leicester, or Romney-Lincoln crosses. Early-maturing lambs may be obtained from these crosses.

In New Zealand sheep-breeding the foremost considerations given to foundation flocks are constitution and wool, together with conformation and a symmetrical carcase. The main flocks are grazed on the higher grasslands. The ewe lambs from them are selected each year for the points just mentioned, and graded later into the ewe flock. The standard of the flocks is maintained by this selection of the best within themselves.

The surplus lambs are either sold as fats (many off their mothers), or as stores for fattening on rape, turnips, kale, or other supplementary forage specially grown for the purpose, mostly on the lower, richer lands. The ewes culled from the foundation flocks are sold to and utilized by the smaller graziers and fat-lamb farmers of the more closely settled areas to produce a crop of lambs. The only point considered here is suitability for the meat-export trade, and it is in this phase of farming for lamb-production that consideration is given to the cross with the short-woolled breeds of sheep (usually Downs) for the production of a medium-sized, compact, uniform, and symmetrical carcase.

In mating, the usual number of rams used is about 2 to 2½ per cent. —that is, one to fifty or one to forty ewes. The use of one to fifty is the more common on level, unbroken lands, and proves effective and efficient, especially if the ewes are rounded up or placed in small paddocks occasionally for a night, and provision made for a few rams to be kept fresh and used in the final tupping-week. The rams are kept on good feed and in good service condition, but not allowed to become gross before the period of service.

The time of putting out the rams is governed by climatic, altitudinal, and latitudinal conditions, and varies from the latter part of February to the middle of April. The rams are kept with the ewes for about six weeks, and then drafted out. This ensures a lamb harvest completed within a definite period. It is not a general practice to flush the ewes during the mating-period. In most seasons in the New Zealand climate the growth of autumn feed provides sufficient incentive, though there are sometimes years when flushing is beneficial.

After docking, the lambs are run with the mothers on good grass-pastures or on supplementary crops, and care is taken that they

receive no check, in order that as many prime milk-fat lambs as possible shall be available for freezing. In years when feed is abundant the proportion of milk lambs is large; in ordinary seasons 50 per cent. would be the outside limit. The remainder, after weaning, are placed on breaks of forage crops to be fattened. Milk lambs are usually ready for the market in from twelve to fourteen weeks. Those weaned and fattened on pasture or forages go to the freezing-works in from twenty to forty weeks. Prime-quality first-grade lamb ranges from 36 lb. to 40 lb. dressed-carcase weight. Carcases over 42 lb. are paid for as second quality.

For lamb-fattening on forage crops land of comparatively high value—say, up to £50 per acre—is often used. For breeding alone a value capitalized on a rental of 7s. for every wet ewe the land is capable of carrying per acre is a fair basis of calculation for a valuation of the land as a business proposition. Carrying-capacity on pasture alone may be put at from one-half to three sheep per acre, but aided by cultivation and supplementary forages six, seven, or even eight sheep can often be carried.

It will be seen that there are three main variations of farming conducted in connection with the fat-lamb business:—

(1.) The breeding of lambs in the foundation flocks, the surplus remaining after the better ewe lambs have been drafted for the maintenance of the flock being sold as freezers, or as stores to growers of supplementary forages for fattening.

(2.) Sheep-raising on the richer and more improved lands by farmers who breed their own ewe flocks (reserving a selection of ewe lambs each year) and grow sufficient fodder to fatten the lamb crop, and also the ewes culled annually.

(3.) The annual purchase by graziers and croppers of supplementary forages of breeding-ewes from culled station lines, from which a crop of lambs is produced and turned off as freezers. The ewes are also fattened and sold off either annually or every second year. This method of quitting both the ewe and the lamb necessitates the purchase each year in the open market of surplus station cull ewes. When the high-country lambing percentages are below the average, and as a consequence the quittings from the stations are limited, such procedure may make the prices paid for ewes in the autumn abnormally high. This explains the lack of uniformity in values of breeding-ewes over any period of years.

There are also general farmers who grow areas of forages, turnips, &c., and either sell the crops to others for fattening purposes, or themselves purchase store lambs and fatten them in autumn.

Levy on Export Fruit.—An Order in Council under the Fruit Control Act, gazetted on 1st October, prescribes that the levy on export fruit produced in districts in which Part I of the Act is in operation shall be 1d. per half-bushel case and 2d. per bushel case. This replaces the previous scale of ½d. and 1d. respectively.

WAIMAUNGA EXPERIMENTAL FARM.

NOTES ON OPERATIONS, SEASON 1924–25.

C. S. DALGLIESH, Fields Instructor, Hokitika.

THE principal features in the development of Waimaunga Experimental Farm (Grey Valley) during last season were the provision of farm-buildings and a residence, and the introduction of a dairy herd—grade Jerseys and Guernseys from Moumahaki Experimental Farm, to be headed by a Jersey bull. The farm-steading consists of a cow-byre, open-fronted hay and implement sheds, and a three-stall stable, all under one roof and covering 1 chain square. The separator and engine rooms are detached from the main building.

PASTURES.

For particulars of pastures established in Fields 1, 2, 3, and 4 interested readers are referred to the writer's article in the *Journal* for September, 1924. A study of these pastures strongly emphasizes the fact that management must take precedence over mere expenditure.

Field 1, which had less expensive and also less preparatory treatment than the others, is more than holding its own in the production of feed and in lasting quality. This field was sown in November, 1921, and was top-dressed in May, 1924, as follows: (1) Basic slag, 3 cwt. per acre; (2) superphosphate and Nauru phosphate (equal parts), 3 cwt.; (3) carbonate of lime, 1 ton; (4) carbonate of lime, ½ ton, followed by 1½ cwt. superphosphate in the spring. Little or no difference has been noticeable in any of the dressings as compared with the control plot, but the pasture has carried stock well.

Field 2 (sown in temporary pasture in September, 1922) received much more preparatory cultivation and a more liberal liming, but it has largely reverted back to sweet vernal. This may be attributed to the smothering effect of the clover in the early part of the first year, its prolific growth smothering out the Italian rye-grass to a great extent. In this same field on a 2-acre area sown with a similar seeding a year later, but which has been continually fed down with stock, there has been a much better pasture and no reversion to sweet vernal.

The strip of land through Field 2 which did not receive an application of lime has proved an interesting feature. In the first year after sowing, the pasture on this area consisted of a thin distribution of sorrel, catsear, and inferior grasses. During the early part of last summer sweet vernal predominated; later on brown-top came very prominently into possession; and at present the strip very distinctly represents a pasture of poor carrying-capacity, and is very much left alone by stock.

The area of Fields 1 and 2 is 34 acres, and during from September to February last they carried and fattened 180 two-tooth ewes and wethers, the wethers killing at an average dressed weight of 63½ lb.

FIG. 1. PASTURE IN FIELD 2, WAIMAUNGA EXPERIMENTAL FARM.
Showing unlimed strip across centre of field, with brown-top dominant and neglected by stock.

FIG. 2. SOME OF THE TWO-TOOTH WETHERS FATTENED IN FIELDS 1 AND 2.

In addition, Field 1 carried forty milking-cows and six head of young stock during the last three weeks of December. January and the first two weeks of February were exceedingly dry, and pastures were consequently very bare, but after being spelled they quickly recovered.

Field 7 was sown in December, 1923, in a permanent-pasture mixture of—perennial rye-grass, 15 lb.; cocksfoot, 12 lb.; crested dogstail, 3 lb.; meadow-fescue, 4 lb.; red clover, 2 lb.; alsike, 2 lb.; white clover, 2 lb.; Lotus major, 1 lb., per acre. The land was manured with 2 cwt. superphosphate per acre, and limed in weights of 5 cwt., 10 cwt., 15 cwt., and 1 ton per acre. The heavier dressings of lime have undoubtedly given the best results. The 5 cwt. and 10 cwt. dressings have also given satisfactory results, though probably there is a little more weed-growth in the 5 cwt. area. The fact of this field having been utilized as a run-off for sheep which were feeding on

turnips in the winters of 1922 and 1923 played an important part in the good results obtained with the lesser weights of lime. Lighter applications of lime, together with the incorporation of humus in some form or other, produce a better and more lasting pasture than can be obtained with lime and artificial fertilizers alone.

FIG. 3. SHOWING PASTURE IN FIELD 7 (BEYOND FENCE) WITH ABUNDANCE OF CLOVER. LIME TREATMENT, 5 CWT. PER ACRE.

The grass in the foreground of photo is mainly sweet vernal and brown-top.

FIG. 4. NEAR VIEW OF PASTURE IN FIELD 7. LIME TREATMENT, 10 CWT. PER ACRE.

Field 7 was utilized for haying purposes last season, owing to the farm being understocked, and this has been detrimental to the permanent pasture. The prolific growth of clover when allowed to get away, as for haymaking, certainly has a depressing effect on the grasses. The practice of haying permanent pasture is admittedly bad; temporary pastures, such as Italian rye-grass and red clover, should be used for this purpose. Owing to the farm being understocked, a good deal more meadow hay was made than was required for the season.

SPECIAL HAY CROPS.

Areas of 4 acres of oats and peas and 4 acres of oats and vetches were grown on land which the previous year had grown oats for chaff and had then received 5 cwt. lime and 2 cwt. super per acre. The ground for the special hay crops was ploughed in early August, and had preparatory cultivation during September. Half the area received a dressing of carbonate of lime at 10 cwt., and the other half 5 cwt. ground burnt lime, per acre. The crops were sown across the field so as to test each form of lime.

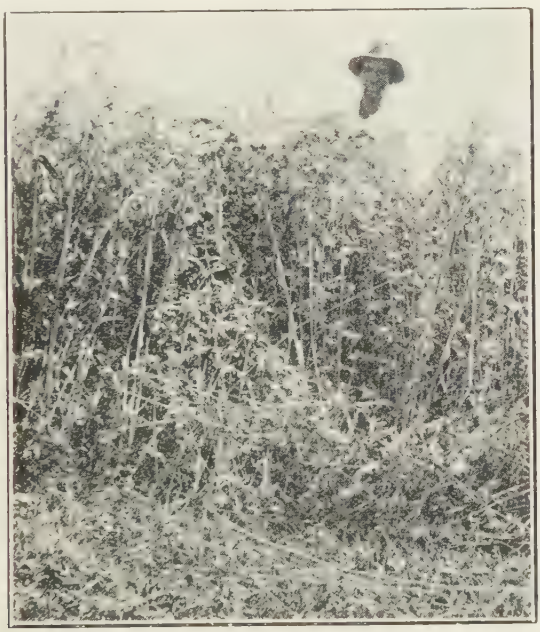


FIG. 5. CROP OF OATS AND VETCHES FOR HAY.

The peas and vetches were sown on 1st October, and the oats immediately after. The seedings per acre were: Garton oats, 1½ bushels, and Partridge field-peas, 2 bushels; Garton oats, 1½ bushels, and vetches, 1½ bushels. Both mixtures gave heavy crops, showing better growth than the previous oat crop. The oats and peas were the more equal and easily handled and cured crop of the two; the hay-yield was 2 tons 11 cwt. per acre, harvested on 30th January.

The oats and vetches were a heavier crop than the oats and peas; much of the crop was down at time of harvest, making the work difficult. The vetches predominated, and retarded the growth of oats from the commencement. The sowing of less vetches than 1½ bushels per acre may be recommended; ¾ bushel to 1 bushel should be ample to sow with 1½ bushels of oats. This crop produced 2 tons 17 cwt. of hay per acre. The hay was fed to dairy stock during the winter and eadily eaten.

OATS FOR CHAFF.

This crop consisted of 5 acres Algerians, 3 acres Garton's, and one each of the Crown, Victory, Black Tartar, and Great Mogul varieties. All varieties were sown on 7th October. The land—old pasture—was ploughed in the winter, and was manured at time of seeding the oats with 2 cwt. per acre of super and Nauru phosphate in equal parts. All varieties were light, but the Garton's produced the greatest weight per acre. The Algerians—the earliest for harvest—were cut on 2nd February, and the other varieties a week later.

ROOT CROPS.

Carrots and Mangolds.—These consisted of 1½ acres of Matchless White carrots and 1¼ acres of Prizewinner Yellow Globe and Long Red mangolds, both crops being grown on land having received similar cultivation and liming treatment. One ton of lime per acre was applied; a strip 1 chain in width across the field was left without lime, and 1 chain width received 1 ton carbonate of lime per acre. Both crops were sown in raised drills during the last week in October.

The carrots were quite a good crop, averaging on the limed land 31 tons per acre, and on the carbonate-of-lime strip 28 tons. On the area which received no lime the roots were small and not worth weighing. The manure used was 1½ cwt. super and 1½ cwt. bonedust per acre.

The mangolds gave good promise at first, but later failed to thrive. The Prizewinner variety, however, did better than the Long Red. The manurial treatment was varied as follows: (1) Equal parts of super and Nauru phosphate, at 5 cwt. per acre; (2) super (two-thirds) and blood-and-bone (one-third), at 3 cwt., 5 cwt., and 8 cwt. per acre. The whole crop was poor and not considered worth weighing, as no definite results could have been obtained.

Swedes.—An area of 2½ acres of swedes was grown on land which had produced a very heavy crop of oats and vetches in the preceding season. The land for swedes was ploughed in the first week of August. No endeavour was made to cultivate to keep weeds in check; they were allowed to make fair growth, and then ploughed under in the third week of October The land was again ploughed at the latter end of November. It was thus allowed to stand in the furrow the maximum length of time. In this district, where there is a high and consistent rainfall, by cultivating to keep down weeds the land is made fine, becomes air-locked, and the soil cannot get aerated. The swedes were sown in raised drills on 12th and 13th December; variety, Superlative; seeding, 12 oz. per acre. One ton

of lime per acre was applied during the first cultivation after the latest ploughing.

The area was treated experimentally with manures, the control manure being 1 cwt. each of super and bonedust per acre, and other manures being added. As this experiment was carried out for the sole purpose of determining the action of manures on the quality of the roots, the subject will be dealt with in a later article. The whole crop made excellent growth, and the major portion was thinned within the first month. Little trouble was experienced with weeds. During the investigation a number of weighings were made, and the crop averaged 36 tons per acre.

Turnips.—Two acres of the following varieties of turnips were sown in the same field as the swedes: Hardy Green Globe, Imperial Green Globe, Green-top Yellow Aberdeen, and Purple-top Aberdeen. These were not sown in raised drills, but on the flat. The manure used was 1 cwt. super and 1 cwt. Nauru phosphate per acre; 6 cwt. of lime was also applied. The larger portion of the land received cultivation similar to that of the swede land. Three small areas were reserved for late ploughing experiments; they were not ploughed in early August together with the other part of the field, but were turned over about the third week in November and given good cultivation. All varieties made excellent growth during the first few months, and gave promise of a heavy crop, but this did not continue, and the crop all round was a light one. The land which received the three ploughings and little cultivation was markedly free of weed-growth.

CHOU MOELLIER.

A small area of this fodder plant was grown, with good results. Liming, 1 ton lime per acre; manure, 3 cwt. per acre of mixed super and bonedust; seeding, 1 lb. per acre, in drills 26 in. apart. The seed germinated very quickly, and the plants made quick growth and were thinned to about 18 in. apart. Owing to being without dairy stock on the farm in the autumn this fodder was not utilized as it should have been. It was fed to yearling cattle during the winter, and was eaten in preference to turnips.

FIG. 6. FARMERS' FIELD-DAY GATHERING AT WAIMAUNGA.

[*Photo by C. S. Dalgliesh.*

GENERAL.

In addition to the dairy herd (thirty-two cows and heifers, and eight yearlings) now on the farm, there are 102 two-tooth Romney-cross ewes, which will be bred from this season. Two Border Leicester rams have been purchased from Lincoln College for this purpose.

In December last pupils from the Greymouth High School and Cobden primary school paid a visit to the farm. On 15th July a very successful field day was held in connection with the Westland winter farm school.

SUBTERRANEAN CLOVER IN PASPALUM PASTURES.

C. J. Hamblyn, B.Ag., Assistant Instructor in Agriculture, Auckland.

The value of subterranean clover in paspalum pastures is well recognized by farmers in the Auckland Province. This is evidenced by the large number of farms on which efforts to introduce this clover have been made. In many cases failure has resulted, and careful inquiries have been made as to the relative success of the various methods adopted.

As far as the better-class volcanic soils are concerned, no difficulty is experienced, for on them subterranean clover naturally establishes itself. On such soils where the pasture otherwise consists dominantly of rye-grass, cocksfoot, and white clover the presence of subterranean clover in large amounts is not altogether desirable, as it has a tendency to leave large bare patches in midsummer, and these frequently become invaded with weeds. Where paspalum is dominant on such soils, subterranean is the most valuable of all clovers, not only yielding well when the production from paspalum is at its lowest point, but also stimulating the summer development of that grass and at the same time lessening any danger of a root-bound condition arising.

Paspalum, however, is, or should be, frequently the dominant grass on soils of much lower fertility than those of volcanic or alluvial origin. On these it often becomes completely dominant, to the almost complete exclusion of all other grasses and clovers. Paspalum, being a gross feeder, soon lowers the surface fertility of poor soils, with the result that, although quite permanent, its seasonal yield falls away, and a root-bound condition, giving very little feed, results. It is on soils of this description and where the paspalum pasture is root-bound that the farmer particularly desires to establish subterranean clover, and it is just under these conditions that failure has most frequently occurred.

The introduction of subterranean clover can be viewed from two distinct points—its introduction during the actual establishment of paspalum pasture, or after the paspalum has become more or less sod- or root-bound. In the former case subterranean clover, at the rate of 1 lb. per acre, is frequently sown in the autumn on cultivated

land with a pasture mixture containing paspalum. The subterranean clover generally germinates well, but has a decidedly bad effect on the paspalum by tending to smother out the young plants. It is therefore better to establish the paspalum without subterranean clover, and rely on other methods for its later introduction.

A popular method in the past has been to surface-sow old sod-bound paspalum areas with 2 oz. to 1 lb. of subterranean clover, with or without other grass-seeds and manure. The paspalum is either fed off closely or burnt before this sowing, which latter is done either in the autumn or early spring. This method is the simplest and most generally adopted, but has so far given little success. The subterranean-clover seed, being large, is easily found by birds, which also do much damage by attacking the young plants as they appear above ground. Comparatively few plants survive, as the birds seem to prefer subterranean to either white or red clover. Again, the fertility having fallen well below that required for white clover (and especially is this so on root-bound areas), it is also too low to maintain subterranean clover in thriving condition. Therefore, unless top-dressing is maintained, the clover soon goes out.

Another method is the sowing of 1 lb. to 2 lb. of subterranean-clover seed, with or without other grasses and clovers, on an area of paspalum renovated by ploughing. The area is ploughed in narrow furrows after the first autumn rains, left a few weeks for the paspalum to push through between the furrows, then disked and surface-sown with rye-grasses and red, white, and subterranean clover. If the ploughing cannot be done in the autumn it may be left till early spring (August or September), but it must be done while the soil is moist. This method has proved a success, especially where fertility is maintained by top-dressing. It is undoubtedly the best method to adopt, and should be carried out on a small area first. When once established the subterranean-clover seed can be easily spread on to other paddocks by stock, especially by feeding out hay saved from an established paspalum-subterranean clover pasture.

The seed of subterranean clover is costly, and large areas mean a considerable loss in the event of failure to establish. The following points should be remembered: (1.) Subterranean clover will not grow luxuriantly on the poorest soils; it demands a fertility standard almost as high as that for white clover. Therefore top-dressing is essential. (2.) Subterranean-clover seed is taken by birds when surface-sown. The seed should be covered. (3.) The young plants are readily eaten by birds, especially when a thin seeding is made. It is better to sow 1 lb. to 2 lb. on a small area specially prepared to establish the clover, and then, by feeding out hay and by means of stock-manure, carry it on to other paddocks. (4.) When sown with paspalum-seed it tends to smother the young paspalum-plants. The best plan is to establish the paspalum pasture first, and then introduce the subterranean clover as a part of the renovation, or by feeding out hay containing the seed.

Noxious Weeds Orders.—Toad-flax (*Linaria vulgaris*) has been added to the Third Schedule of the Noxious Weeds Act. The Thames County Council has declared foxglove to be a noxious weed within that county.

RABBIT-POISONING BY STRYCHNINED THISTLES.

Live-stock Division.

MUCH interest has been shown recently in a method of poisoning rabbits by means of strychnine applied to thistles, introduced in Central Otago by Mr. James Tait, of Kawarau Gorge. Over extensive areas of rough depleted country in this district wing thistles form a large part of the vegetation, and are fed on naturally by the rabbits. The danger of sheep or other stock being also poisoned is said to be avoided by the fact that the strychnine is applied to the root of the thistle below the ground surface.

The method has been investigated lately by officers of the Agriculture Department, and the following report by Mr. F. R. Bould, Inspector of Stock, Clyde (dated 4th August, 1925), is published for general information :—

On 27th July Mr. Tait demonstrated to me his method of laying the strychnine. The method is simple, a scrape being made at the root of the thistle, which is split in half, showing from 3 in. to 4 in. of white surface. Strychnine prepared in the form of a thin paste is applied to this part of the thistle with a brush.

On the following days a demonstration was carried out on Messrs. Holloway Bros.' run, on country that had been pollard-poisoned in the autumn, afterwards being trapped, and recently strychnine-poisoned with carrots on a furrow. The piece of country chosen was a rough stony face difficult to get on to with a horse, and a likely place in which to see rabbits among the rocks. Four hours were taken to treat the thistles, and the following morning 120 dead rabbits were picked up. The next day the ground was again gone over, and forty-two more rabbits were taken off.

One of the most surprising things noticed was the number of very old rabbits, and also the number of those without all their legs, having been trapped at some time or other. I am of the opinion that these are the rabbits that are seldom seen, and which are responsible for the infestation in the spring of country that appears after the winter to be in good order.

I also inspected Mr. Malcolm Ritchie's run, on which Mr. Tait carried out his initial experiments. Some of this was very rough rocky country—just the place for rabbits to thrive on—and had been well pollard-poisoned and trapped. When only 10 per cent. of the traps were getting rabbits in them, and the property had a good appearance so far as rabbits were concerned, Mr. Tait's method was tried without in any way spelling the ground. The result was 400 rabbits taken off 200 acres in a few days. Since then the warrens have all been blocked up, and, at the time I inspected, no sign of any being opened could be seen. The balance of the run of some 2,000 acres is in a similar condition, only three rabbits being seen during five hours spent in inspecting the property.

Questioned as to the danger to sheep, Mr. Tait stated that he had poisoned the whole of Mr. M. Ritchie's run among the sheep and did not kill one ; further, he was prepared to do likewise on any other property. The method of laying did not give sheep much chance of eating any of the strychnine-treated thistles. Several other instances were given of good catches of rabbits on country appearing to be fairly clear of the pest.

In conclusion, I can say that the demonstration given was satisfactory from the point of view of getting the odd rabbits that inhabit the rocky ground—a difficult matter generally. The method is simple and easily carried out, and country where trapping is impossible and carrying carrots in for feeding before poisoning is laborious work can be done by it with a minimum of labour.

The period for which this method would have the best effects appears to be from early in June onwards, when the rabbits feed on the thistles as their natural food. It is a method also that would supersede trapping at this time of the year (August) on country where thistles can be found.

Mr. Tait is to be commended for the manner in which he is making this method generally known. After he found that it succeeded in getting rabbits where other methods failed, he informed all and sundry in the district around him.

The Department's District Superintendent for Otago has arranged for further trials to be carried out in different districts and on various classes of country, such as bare, tussocky-grass paddocks or river-beds, if thistles exist there. On completion of these tests, if further information of value is brought out, another report will be made.

It may be added that the use of this method of rabbit-destruction is not confined to Central Otago; the Department has knowledge of its having been used elsewhere, although not to any great extent.

BOYS' AND GIRLS' AGRICULTURAL CLUBS.

TARANAKI-WANGANUI DISTRICT COMPETITIONS, 1924-25.

J. W. Deem, Instructor in Agriculture, Wanganui.

Competitions on similar lines to those of previous years were carried out last season in the North and South Taranaki and Wanganui districts. The activities consisted of mangold and carrot growing in all three districts, calf-rearing in North and South Taranaki, and a poultry competition at New Plymouth. Sixty schools took part in the competitions, but in the case of some schools only one or two entries were made.

ROOT-GROWING.

The season, on the whole, was not a good one for this branch of the competitions. The weather was very changeable, and, added to this, the schools were closed for a long period owing to the epidemic of infantile paralysis. However, the judges were able to report that the closing of the schools had not done so much harm as was anticipated, and the standard of cultivation set up last year was well maintained.

The changeable weather and excess of moisture during the growing season were not very favourable for mangolds, and the average crop dropped from 56 tons 14 cwt. per acre in 1923-24 to 47 tons 11 cwt. On the other hand, the moist season suited carrots, and the average for this crop advanced from 28 tons 7½ cwt. to 35 tons 12 cwt. The heaviest crop of mangolds for the season was grown by Clarence Morrison, of Turakina. It weighed 101 tons 7 cwt. per acre, against Jean Miller's crop of 138 tons 13 cwt. in the preceding season. In carrots the best crop was grown by Roy Calvert, of Hillsborough, weighing 66 tons 13 cwt. per acre, against the 58 tons 10 cwt. crop grown by Freda McNeill, of Rawhitiroa, in 1923-24.

Material was supplied for 429 plots, and of this number 282, or 66·4 per cent., completed and were judged. In the preceding year the percentage of completions was 61·5. As has been the case in previous years a large number of plots were destroyed by stock gaining access to them before judging-time. It is difficult to understand parents allowing this to happen year after year.

The placings for the championships were as follows :—

Mangolds.—North Taranaki : Eric Calvert, Hillsborough, 92 tons 1 cwt. per acre, 178 points, first ; H. Graham, Waitara, 87 tons 2 cwt., 170 points, second ; D. Muir, Waitara, 88 tons 17 cwt., 169¾ points, third.

South Taranaki : Phillip Wakelin, Toko, 98 tons 5 cwt., 191¾ points, first ; Beatrice Oldfield, Okaiawa, 96 tons 5 cwt., 190¾ points, second ; Edna Dakers, Kaupokonui 81 tons 5 cwt., 175¼ points, third.

Wanganui : Clarence Morrison, Turakina, 101 tons 7 cwt., 196¾ points, first ; Dorothy Richardson, Maxwelltown, 78 tons 5 cwt., 171¾ points, second ; Hugh Middleton, Waverley, 65 tons 5 cwt., 156¼ points, third.

Carrots.—North Taranaki : Monica Fabish, Tataraimaka, 55 tons 8 cwt., 148½ points, first ; Roy Calvert, Hillsborough, 66 tons 13 cwt., 147¾ points, second ; J. Keenan, Egmont Village, 51 tons 15 cwt., 144¼ points, third.

South Taranaki : Norman Hocken, Matapu, 66 tons 10 cwt., 153½ points, first ; Willie Dakers, Kaupokonui, 56 tons 15 cwt., 148¾ points, second ; R. Bobock, Ngaere, 56 tons 5 cwt., 143¼ points, third.

Wanganui : Bruce Duke, Kakaramea, 50 tons 12 cwt., 145 points, first ; Geo. Boswell, Maxwelltown, 58 tons 13 cwt., 141½ points, second ; Daphne Newman, Waitotara, 45 tons 6 cwt., 141½ points, third.

Very fine displays of roots were made at the New Plymouth, Hawera, and Wanganui winter shows. The competitive classes for roots grown by members of the clubs were also well patronized, the exhibits in some cases being better than anything shown in the open classes.

CALF-REARING

These competitions were confined to North and South Taranaki, there being sixty-five entries in the former and 122 in the latter. The calves were grade heifers, and were divided into classes representing the various breeds. Ninety-six calves judged in South Taranaki were made up of eighty-one Jerseys, ten Friesians, four Shorthorns, and one Ayrshire ; while of fifty judged in North Taranaki thirty-six were Jerseys, seven Friesians, six Shorthorns, and one Ayrshire.

In addition to the judging for the best reared calf some districts provided prizes for the best dairy type. In 1923–24 the points for cost of feeding were reduced from 100 to 50, but in the season under review it was decided to cut these points right out so far as judging the calf is concerned. The information is still shown on the charts.

The championships for South Taranaki are as follows :—

Jerseys.—E. Putt, Huinga, first, with 180½ points ; food used, new milk, whey, and hay tea ; cost, 14s. 4½d. N. Wisnewski, Huinga, second, 176½ points ; food used, new milk, whey, and Ceremilk ; cost, 16s. 5½d. Lester Gernhoefer, Rawhitiroa, third, 173 points ; food used, new milk, skim-milk, and Moose linseed-meal ; cost, 14s. 9d.

Friesians and Shorthorns.—May Jones, Finnerty Road, first, 173 points ; food used, new milk, whey, and linseed ; cost, £1 3s. 8½d. Bessie Seed, Matapu, second, 170½ points ; food used, new milk, whey, and Tui calf-meal ; cost, 9s. 5d. M. Major, third, 167½ points ; food used, new milk, skim-milk, and Moose linseed-meal ; cost, £1 2s. 5d.

Taking the calves placed first, second, and third in four groups, the following averages are obtained: Jerseys—Cost of food per calf, 13s. 8d.; points gained by competitors, 172·2. Friesians and Shorthorns—Cost of food, 18s. 10d.; points, 154·3.

The highest cost set down for feeding a calf in South Taranaki is £2 18s. 5d., and the lowest 7s. 9d. In the former case the competitor gained 38 points for chart and 98 for condition, and in the latter 38 points for chart and 100 for condition. These results make plain the necessity of cutting out the points allowed for cost of feeding.

The standard of values for foods fixed by the committee is as follows:—

	s.	d.			s.	d.	
Fresh milk ..	6	0	per 100 lb.	Moose linseed-meal	20	0	per 100 lb.
Pan-skimmed milk	1	0	,,	Moose nuts ..	18	0	,,
Skim-milk (home)	0	8	,,	Crushed barley ..	11	6	,,
Skim-milk (factory)	0	6	,,	Linseed-meal ..	22	6	per cwt.
Whey	0	2	,,	Crushed linseed ..	26	0	,,
Palmer's calf-meal	21	0	,,	Linseed (whole) ..	20	0	,,
Oatmeal ..	21	0	,,	Crushed oats ..	12	6	per 100 lb.
Ceremilk ..	27	6	,,	Sharps (pollard) ..	10	6	,,
Tui calf-meal ..	23	6	,,	Faterine ..	20	0	per gallon.
Meggitt's linseed-meal	15	0	,,	Hay tea ..	0	3	per 100 lb.

NOTE.—Washings of separators or cream-coolers absolutely barred.

JUDGING A CROP COMPETITION IN SOUTH TARANAKI.

Manufacture and Export of Casein.—The annual report of the Dairy Division for 1924–25 states that the grading of casein has been continued through the year at Wanganui and Auckland. There has been improvement in the quality, and the uniformity of consignments exported has reflected credit on the manufacturers. Efforts have been made to secure a cleaner skimming, so that the skim-milk from which the casein is made will contain a minimum of butterfat. By improved methods manufacturers are now able to make a rennet casein of good commercial quality, containing not more than 1 per cent. of fat, and this is finding a ready market. During the year ended 31st March, 1925, the quantities exported represent some 2,363 tons of lactic casein and 295½ tons of rennet casein, making a total of 2,658½ tons.

AGRICULTURAL EDUCATION IN NEW ZEALAND.

REPORT OF THE BOARD OF AGRICULTURE.

(Presented to Parliament by the Minister of Agriculture, September, 1925.)

PREFACE.

I. NOTES ON THE SYSTEM OF PUBLIC EDUCATION IN THE DOMINION, WITH SPECIAL REFERENCE TO THE PRESENT PROVISION FOR INSTRUCTION IN AGRICULTURAL SCIENCE.

THE general control of public education, and the inspection of all public primary, secondary, and technical schools, are in the hands of the Education Department, which administers the funds provided by Parliament for educational purposes. The Department also controls directly the Native primary schools and special schools of various kinds. The Department classifies all teachers, fixes all salaries, conducts examinations, and prescribes syllabuses of instruction. The direct control of primary schools and district high schools is, however, in the hands of the Education Boards of the nine education districts, each school being also managed by a local School Committee under the Board. The Boards of Education are also in most cases controlling authorities of technical schools, which, however, are directly managed by more or less independent Technical School Boards wherever the importance of the school warrants the employment of a full-time staff. Secondary schools generally are controlled by independent Boards of Governors, subject, however, to the Act and regulations administered by the Education Department, which thus exercises a general supervision over all schools supported by public funds.

The total cost of public education in the Dominion amounts to about £3,250,000 per annum, of which less than £200,000 is provided from reserves revenue, over £3,000,000 being paid from parliamentary votes.

PRIMARY SCHOOLS.

Primary education is free and compulsory for children between the ages of seven and fourteen. The primary-school life of the children extends normally over a period of about eight years, between the ages of five and thirteen, but no child may leave school before gaining a Sixth Standard certificate of proficiency unless he has reached the age of fourteen years. Statutory provision exists for increasing the age-limit of compulsory attendance at school to fifteen years.

The primary-school syllabus includes subjects of instruction grouped under the general headings of—(1) English, including oral and written expression; (2) "Graphic" expression, including drawing and handwork; (3) Arithmetic; (4) Man and nature, including nature-study, geography, elementary science, and home science; (5) Man and society, including history, civics, and moral instruction; (6) Physical training, including physical exercises, swimming, and lessons on hygiene and health.

No attempt is made to treat any of the subjects from a vocational point of view, the aim of primary-school instruction in the subjects included under heading (4) not being directed towards any particular

occupation, but rather towards awakening the interest of children in natural phenomena, inculcating a love of nature, and also giving an elementary training in scientific method.

The nature-study and elementary-science work in the primary schools is, however, generally supervised by instructors who have had special training in agriculture and agricultural science, and in this way these studies are given a practical flavour, which is, moreover, reinforced by actual practical work in the school-garden, and, in some districts, in the home plot cultivated by the child in connection with agricultural-club competitions.

JUNIOR HIGH SCHOOLS.

Legislative provision was made in 1924 for the establishment of junior high schools which should form a connecting-link and trying-out field between the primary school and the secondary school. Such schools provide a three-years course for pupils who have qualified for attendance by gaining a certificate of competency of Standard IV of the primary-school course—*i.e.*, the curriculum is intended to cover what has ordinarily been the last two years of the primary course and the first year of a secondary course. All pupils in the junior high school are required to take, for approximately half the school week, the same instruction in the subjects of the primary-school syllabus; for the remainder of the school week the pupils take, according to the decision of the Principal after consultation with the parent and the head teacher of the school previously attended, a supplementary course of instruction taken from the following: Academic, manual, commercial, agricultural, art, or other approved course. Provision is made for a change of course.

It is not intended that the supplementary course shall be vocational in character, but rather that it shall be designed to discover the special aptitudes of pupils, with a view to their transfer from the junior high school to a suitable calling, or to an appropriate higher educational institution, at the end of the three-years course. One such school is being established at the present time in a country district, but no information is yet available as to the character of the course in rural science which will doubtless be a leading feature of its curriculum. A junior high school may be placed under an Education Board (and School Committee) or under a High School or Technical School Board.

PUBLIC INSTITUTIONS FOR SECONDARY EDUCATION.

In addition to the junior high school, three classes of full-time post-primary schools are provided for under the Education Act—namely, district high schools, technical high schools, and secondary schools.

A district high school is a public school having a primary department in which primary instruction is given, and a secondary department in which secondary instruction is given. A district high school is governed by the Education Board and School Committee. District high schools are established mainly in rural centres where only a moderate demand for secondary instruction exists. The headmaster manages both secondary and primary departments, and receives extra salary on account of the secondary department, in which special

secondary assistants are employed. A district high school may be established where there is at least twenty prospective secondary pupils.

Technical high schools are full-time day schools providing secondary instruction, including vocational and technical courses. A technical high school is not usually established unless at least one hundred secondary pupils are qualified and willing to attend. Such schools are usually under the direct management of a Technical School Board, which may be under the general control of the Education Board of the district.

The term "secondary school" is restricted to schools of more academic type, usually possessed of special endowments and governed by an independent Board of Governors. Substantially the same qualification for free admission is required in all post-primary schools, the minimum qualification being a Sixth Standard certificate of proficiency or its equivalent, which entitles the holder to free secondary education for two or three years, according to circumstances, while at the end of two years the pupil may qualify for a further period of free tuition up to the age of nineteen years.

About two-thirds of all the pupils in Standard VI in the primary schools proceed to free tuition in post-primary day schools under these conditions. The courses in secondary schools and district high schools are usually taken in preparation for the Public Service Entrance and Matriculation Examinations, and preponderance is given to the more academic types of studies. In the country district high schools, however, provision is made by regulation that all boys holding junior free places—practically all boys in the first two years—shall take practical agriculture and dairy science for at least two hours weekly, unless equivalent instruction of a vocational character is otherwise provided. In most of the secondary schools also provision is made for training in elementary agricultural science, and in many cases practical work is also done in the field. In some of the technical high schools, particularly in country districts, prominence is given to the agricultural course (the Feilding Technical High School, for example, definitely calls itself the Feilding Agricultural High School).

The course in agriculture in all post-primary schools is usually under the direction of instructors who have specialized in agricultural science and possess either a degree or a diploma in agriculture. In the district high schools the work is supervised, and often largely done, by the itinerant instructors in agriculture appointed by the Education Boards to take charge of the supervision of nature-study and elementary science in the primary schools. There are, however, some sixty-eight district high schools and about 2,570 primary schools, while the number of itinerant instructors in agriculture employed by the Education Boards is only about twenty-five, so that in the main the science and agriculture must be taught by the permanent staff, with, in many cases, little or no personal assistance from the itinerant instructors in agriculture except by way of rare visits, and during refresher courses held from time to time, sometimes at a State farm, where the instructors under the Department of Agriculture are also available.

In the secondary schools and technical high schools the subject is in the hands of specialists with training in farm practice and agricultural science, several of whom hold the Bachelor of Science degree

in addition to a degree or diploma in agriculture. The agricultural course is not at present popular, being taken by a comparatively small proportion of boys in post-primary schools—not probably by more than one in ten—in spite of the fact that over 30 per cent. of boys leaving secondary schools go farming. Even in technical high schools, where courses in preparation for vocations are specially encouraged, there is a strong demand for instruction in the subjects which are regarded as the best from the point of view of the Public Service Entrance and Matriculation Examinations. In the Matriculation Examination the subject of agriculture may be taken as an alternative to botany or physiology as the second half of the subject of natural science, which is itself an optional subject in the examination. For the Public Service Entrance Examination, agriculture is also an optional subject, ranking, however, with physical science and home science, while dairy science is also included as a separate subject, ranking with hygiene, geology, botany, and zoology.

HIGHER AGRICULTURAL EDUCATION.

A University course in agriculture, leading formerly to the B.Sc. in Agriculture and latterly to the B.Ag., has been in existence for more than twenty years, the Canterbury Agricultural College at Lincoln having been recognized by the Senate for many years as a School of Agriculture.

The statute in operation some twenty years ago required that students should matriculate and then take a four-years course, keeping terms for two years at a University College, and thereafter for two years at a recognized School of Agriculture, and should, in addition to keeping terms by attending lectures and passing the college examinations, also hold a certificate from the School of Agriculture of having passed an examination in practical farm-work. The University examinations for B.Sc. in Agriculture at that time included fifteen subjects, as follows: (1) Mathematics and mechanics; (2) Physics (as for the B.Sc. degree); (3) Chemistry (as for the B.Sc. degree); (4) Biology; (5) Mechanical drawing (as for the B.Sc. in Engineering). (These five subjects could be taken at the end of the second year, or even one section at the end of the first year, at a University College.) (6) General principles of agriculture; (8) Botany; (9) Physiography and meteorology; (10) Entomology; (12) Mechanics applied to agriculture. (These five subjects could not be taken before the end of the third year.) (7) Practical agriculture; (11) Veterinary science and hygiene; (13) Agricultural chemistry; (14) Book-keeping; (15) Surveying and levelling. (These five subjects could not be taken before the end of the fourth year.)

In the year 1915 agricultural science was introduced for the first time as an optional subject in the Matriculation Examination. Certain changes were also made in the prescription for the degree in agriculture, which is now called the B.Ag. The subject of mathematics and mechanics was removed from the syllabus, but algebra and geometry had to be taken at the Matriculation Examination. The degree course was shortened to three years, including only one year at a University College, the subjects being biology, physics, inorganic chemistry, and organic chemistry to the standard of the medical

intermediate examination, and mechanical drawing. The B.Ag. examination in those five subjects could be taken at the end of the first year, and the remaining subjects at the end of the second or third year, but not more than six subjects in any one year. In place of the second year at a University College the student was required to do in some year outside the three years of the course such practical work as the Director of the School of Agriculture might prescribe, and to hold a certificate from the School of Agriculture of having passed an examination in practical work. In 1916 agricultural science was made an alternative to botany or physiology as the second paper in the optional subject of natural science for the Matriculation Examination, and it has so continued ever since. In the prescription for the B.Ag. examination the subject of farm engineering (including heat engines) was substituted for mechanics applied to agriculture of previous years.

Few alterations have since been made in the B.Ag. course, and none in the half-subject of agriculture for the Matriculation Examination, but in 1922 the subject of agricultural science (two papers) was introduced into the list of optional subjects for the B.A. pass examination, a practical certificate being required as for other science subjects.

In 1924 a professorship in agriculture was established at Victoria University College, Wellington, as the result of a gift of £10,000 by the late Sir Walter Buchanan, and a professorship in agriculture is being established in Auckland University College as the result of a bequest of £20,000 from the late Sir John Logan Campbell. The University Senate has recognized both these colleges as Schools of Agriculture.

TRAINING OF SPECIALIST INSTRUCTORS IN AGRICULTURE.

Provision is made by way of agriculture bursaries for students wishing to become instructors in agriculture under the Education Department. Such bursaries may be held at a State experimental farm, an Agricultural College, a University College, or other similar institution under public control in New Zealand approved by the Minister of Education for the purpose. Candidates must have taken a satisfactory agricultural or rural course at a post-primary school and have passed the Matriculation or an equivalent examination.

TRAINING OF TEACHERS.

Provision is made in the teachers' training colleges for some instruction in agricultural science so that teachers may be better prepared to link up nature-study in the country schools with farm experience, and to follow the suggestions of the itinerant instructors. The training of teachers for this work is also continued by the itinerant instructors in most districts by means of short refresher courses held during vacations and, where possible, at a State demonstration farm, so that the assistance of the experts in the Agriculture Department may be obtained. In addition, regular weekly instruction is given to pupil-teachers in science, including dairy science and agriculture, at Saturday classes conducted in suitable centres throughout the Dominion, and often taught by the itinerant instructors in agriculture. The subjects of agricultural science and dairy science are two among

six optional subjects for the Teachers' Class D Examination, and two among twenty optional subjects for the Teachers' Class C Examination. The Class D Examination is the lower qualification, and corresponds in standard, roughly, to the Matriculation Examination. More than 80 per cent. of classified teachers in primary schools hold either the D or the C certificate.

II. NOTES ON THE FUNCTIONS PERFORMED BY THE DEPARTMENT OF AGRICULTURE IN RELATION TO INSTRUCTION IN AGRICULTURE.

The main part taken by the Department of Agriculture in agricultural education, besides the administration of the Ruakura Farm School, referred to elsewhere in this report, has been that of diffusing knowledge by means of more or less direct advice given to producers by the general staff of the various divisions of the Department, aided by its scientifically trained officers. Though its functions were originally purely administrative, the Department, having an intelligent and progressive farming community to deal with, has gradually evolved methods by which a considerable section of the officers engaged in the duties imposed by the various Acts which it has to administer have now become a medium for conveying to producers practical knowledge, based upon scientific facts or conclusions, for the purpose of enabling them to cope to the best advantage with the various animal and plant diseases or pests for the repression of which the legislation entrusted to the Department's administration is designed. The system is by no means uniform throughout, neither is it complete; but it does, on the whole, prove of marked value to producers, and it is satisfactory to note that, as instruction has increased, the necessity for inspection has diminished.

Apart from this combination of instruction with inspection, certain more or less exclusively instructional services are maintained.

The lately established Fields Division is almost entirely devoted to instruction, its field officers' duties consisting mainly of advising farmers, often upon the farm itself, on matters relating to crops, pastures, fertilizers, &c. The keenness of the demand for the services of these officers well illustrates the usefulness of their work. The Dairy Division has its dairy instructors advising and assisting dairy-factory managers, its farm dairy instructors acting in co-operation with dairy factories in advising and assisting dairy-farmers to furnish clean milk, and its milk-testers doing their part towards building up better yielding herds. The Horticulture Division has its orchard instructors and apiary instructors, both combining instruction with inspection. The Live-stock Division has a large staff of inspectors, many of whom now combine instruction with inspection; field veterinarians who give much instruction and advice to pastoralists and dairy-farmers on matter pertaining to animal health; poultry instructors; a wool instructor; and an instructor in swine-husbandry.

Side by side with this work, investigation and research are carried on in the field in close co-ordination with, and based upon, the activities of the three laboratories—veterinary, chemical, and biological—maintained at headquarters by the Department. Each of these establishments is staffed by capable officers, well equipped with

scientific knowledge, who work in conjunction with the field officers, thus enabling the results of laboratory work to be tested out and given practical effect in the field. The Biological Laboratory staff has been considerably increased in late years, and a fourth laboratory, associated with the Dairy Division, and intended to deal with matters of dairy-produce manufacture, is being established. These laboratories have done good work in assisting to meet the requirements of the quickly expanding primary industries in the direction of investigation and research. It is recognized that due regard has been given by the Government to their requirements as to staff and equipment, and no doubt, in view of the present-day realization of the necessity for assisting agricultural education and aiding the further development of the resources of the land, provision will be made for any necessary further growth on sound lines, both as regards staff and accommodation, of these valuable branches of the Department's activities.

Further lines of instructional work lie in the short courses for farmers given in country centres—mostly in the off-season. These are organized by the Fields Division, and officers of all branches of the Department take part in giving lectures and demonstrations to the farmers attending. These courses, termed "farm schools," each occupying about a week, are evidently appreciated by farmers, and they constitute a distinctly valuable means of instruction.

Boys' and girls' agricultural clubs are also conducted in some districts in conjunction with local farmers' organizations, with the assistance of the Education Department, the Department of Agriculture bearing most of the cost. An expansion of this means of instruction is anticipated.

The large State farms at Ruakura and Weraroa have been responsible for much demonstration work, which has proved in itself of great educational value to producers. In addition, a number of smaller farms and experimental and demonstration areas are established in suitable rural centres. Also, two demonstration dairy farms, financed and managed by local enterprise, are assisted by advice from the Department's officers and aided financially by subsidies from the State.

REPORT.

Board of Agriculture, Wellington, 27th July, 1925.

To the Hon. the Minister of Agriculture.

SIR,—

In your letter of 20th February you express the wish that the Board of Agriculture should make an inquiry as to the steps which should be taken to give more adequate attention to agricultural education, as follows:—

With reference to the question of agricultural instruction, the Government is desirous of having a full inquiry made into all phases of it, including the extent to which further instructional facilities in the form of an Agricultural College or Colleges need to be provided in order to adequately meet the requirements of the Dominion as a whole. The matter has been discussed in Cabinet, and a decision arrived at that your Board should be asked if it would undertake this inquiry.

The order of reference will be as follows:—

(*a.*) What new agricultural training institution or institutions are required in order to provide facilities in accordance with the Dominion's present-day requirements for the efficient training of—(i) Students desirous of taking a

University degree in agriculture, fitting them fully to become either instructors or research workers in agriculture; (ii) students desirous of becoming farmers, well equipped with a knowledge of the principles of scientific agriculture as applied to the work of practical farming in all its branches?

(*b.*) The probable number of students of the kind mentioned in sub-paragraph (i) of (*a*) that could be utilized in New Zealand after taking their degrees.

(*c.*) How such an institution or institutions should be equipped as regards staff, laboratories, and farming-land.

(*d.*) Where each or any of such institutions should be situated in order to serve most efficiently the present requirements of the Dominion as a whole.

(*e.*) To what extent, and under what conditions, could the Canterbury Agricultural College be utilized (subject to the approval of the Board of Governors) as an integral portion of the general scheme.

(*f.*) What estimated Government expenditure would be involved by giving effect to the Committee's recommendations regarding paragraphs (*a*), (*c*), (*d*), and (*e*) immediately above.

I appreciate the fact that the members of the Board are all more or less busy men, and that it may be a matter of some difficulty for them all to find sufficient time to devote to this inquiry, but it is felt that, with the knowledge already in their possession, and their intimate knowledge of the requirements of the Dominion in the matter of agricultural instruction, they are well equipped to go into the whole question to the best advantage, and to advise the Government as to the course which should be adopted in establishing a higher and better system of agricultural instruction than exists at the present time.

It was further decided to ask the Board to associate two responsible Government officers representing the Education and Agriculture Departments respectively with it in the inquiry. I should be glad if the Board would undertake this responsibility, and commence its sittings for the purpose at as early a date as is quite convenient to you and to its members.

Full discretion will be given to call evidence, visit existing educational institutions, Government farms, &c., and generally to do any acts which may seem necessary or desirable in order to enable information to be obtained and fully consider a report to be prepared for the information and guidance of the Government.

The Director-General, Department of Agriculture, will be pleased to confer with you at any time with a view to making detailed arrangements as to procedure and any other matters which require to be settled in connection with the conduct of the inquiry.

The Hon. George Fowlds represented the Senate of the New Zealand University, Dr. C. J. Reakes represented the Agriculture Department (at times, in his unavoidable absence, Mr. A. H. Cockayne took his place), and Mr. W. S. La Trobe represented the Education Department.

In compliance with your wish, the Board held a series of meetings for the purpose of taking evidence on the subject, commencing on the 4th March at Wellington, and continuing at Auckland, Wellington, and Christchurch. At each place educational authorities gave evidence, and public notification was given that the Board would hear any other evidence on the subject. During the course of our visits we inspected Ruakura Farm in connection with the instruction given to lads in agriculture. At Auckland, Orakei was viewed, as it was stated that some 50 or 100 acres of this land would be allocated to the Auckland University College Council. Calling at Levin on our way to Wellington, we made a thorough inspection of the Agriculture Department's Weraroa Farm. We then visited the Wairarapa to see the farm given by the people of the district for the training of returned soldiers who wished to go on the land. Evidence was taken as to the suitability of these two latter farms as a site for an Agricultural College. At Christchurch further evidence was taken and

a representative of the Otago University Council stated the views of his Council, so that the Board had the advantage of hearing the opinions of the four University College Councils on the subject. The Board paid a visit to Canterbury Agricultural College, inspecting the buildings, meeting the staff, and inquiring as to its needs. The Board's meetings were adjourned at Christchurch on the 19th March, and members returned home.

To complete the itinerary the Board reassembled at Waipawa on the 22nd April in order to take evidence from Hawke's Bay witnesses and to visit the Smedley Estate, which was bequeathed to the Crown by the late Mr. Josiah Howard for agricultural education.

Returning to Wellington on the 23rd April, the Board inspected the Biological Laboratory of the Department of Agriculture at Kelburn, and later the Wallaceville Laboratory and farm. The remainder of the time in Wellington was spent in the consideration and final adoption of the report. The Board concluded its sittings on this inquiry on the 27th April.

In order to be in a position to answer the questions in the order of reference it was first necessary for the Board to ascertain officially the extent and quality of the provision now made by the Departments of Agriculture and Education by way of agricultural instruction. Representatives of each Department were invited to give evidence, and submitted full information, which is summarized in the preface to this report.

Having in mind that the schools are the nurseries of future farmers, farm training-college pupils, and University students in agriculture, the Board went fully into their relation to agriculture, with a view to discovering not only the extent to which subjects relating to the agricultural industry were taken in the schools, but more particularly as to how far the general curricula of the schools and the work of the teachers were directed towards fostering an understanding and love of country life and country occupations; how far, in short, the education system was being used to oppose the "drift to the town." In this connection the evidence showed that though agriculture was taken seriously in many of the secondary schools, and though considerable sums had in many cases been spent on laboratories and equipment, yet on the whole agriculture was not a popular subject, various reasons being assigned by different witnesses to account for this disconcerting fact. The Board was thus led to a consideration of various matters not definitely included in the order of reference, but having a direct bearing on the question of agricultural education. In regard to some of these the Board would like to express its opinion. Before doing so, however, it will endeavour to give answers to the specific questions set out in the order of reference.

DEFINITION OF TERMS.

During the course of the inquiry it became evident that much misconception existed in regard to the various teaching institutions, and the Board considered that it would be well to define the meaning of the names adopted in this report as follows:—

In the recommendations of the Board—

College of Agriculture means a college either associated with a University College or an institution recognized by the University

Senate. It would in either case be under the government of a Council associated with the Senate, for the purpose of—(i) Training students in the science of agriculture so that they may become teachers or instructors, or (ii) permitting those who intend to become farmers to take a course leading to a diploma or degree if they so desire, or (iii) carrying on "extension classes" for farmers, teachers, or others interested in the industry of agriculture.

Farm Training College, or vocational school, means a farm school under the control of the Department of Agriculture or any properly representative authority which may be established by the Government for the purpose of training students desirous of becoming farmers, well equipped with a knowledge of the principles of scientific agriculture as applied to the work of practical farming in all its branches.

Agricultural High School means a technical high school established under the control of a Board of Managers, on which Board the Education Board of the district is represented, for the purpose of training pupils leaving the primary school and wishing to study the science of agriculture in conjunction with the subjects of a general secondary education.

Primary school means a public school managed by a School Committee under the Education Board of the district, in which primary instruction is given, including training the pupils to take an interest in agricultural matters by means of nature-study and observation.

REPLIES TO QUESTIONS IN ORDER OF REFERENCE.

QUESTION (*a*).—What new agricultural training institution or institutions are required in order to provide facilities in accordance with the Dominion's present-day requirements for the efficient training of (i) students desirous of taking a University degree in agriculture, fitting them fully to become either instructors or research workers in agriculture?

In discussing this question the Board was confronted by the difficulty that whereas on the one hand three University Schools of Agriculture are now recognized by the University of New Zealand (two in the North Island having been recently approved by the Senate, in addition to the Canterbury School of Agriculture at Lincoln, which has been recognized for many years), on the other hand it was overwhelmingly clear from the evidence brought forward that one fully equipped School of Agriculture of University rank could easily provide for a much larger output of trained experts with degrees in agricultural science than would probably be required to cope with the demand for many years to come. It was, however, equally clear from the evidence that a School of Agriculture has other important functions to perform besides that of training experts in agricultural science, especially in a new country as yet incompletely brought into profitable and agricultural pastoral conditions.

All witnesses, particularly those actually engaged in farming or directly connected with the industry, stressed the urgent necessity for investigational work on the many practical problems which vex the farmer in every branch of his business. The Board realized, therefore, that the establishment of professorships in agriculture in the several University Colleges, and the development of research stations, such as the Cawthron Institute in Nelson, would have, apart

altogether from the question of training undergraduates, direct results of the utmost value to the farmers, and consequently to the whole Dominion, while, indirectly, the status of the profession of farming would naturally be raised, and a higher regard for the life and calling of the farmer would be fostered in the community.

Bearing these matters in mind, the Board hopes that due encouragement will be given, in the University Colleges and other research stations, to the training of research students, especially on the agricultural side, and that it may be found possible to provide, in connection with one or more of these institutions, special facilities for post-graduate training in agricultural research work.

As regards the major question of what new provision should be made at the present time for training students desirous of taking a University degree in agriculture, the Board, while fully appreciating the difficulty created by the recognition by the New Zealand University Senate of three University Schools of Agriculture, is clearly and definitely of opinion that one fully equipped and fully staffed residential College of Agriculture will be sufficient for many years to come, and that such an institution should, when established, be placed in a central position in New Zealand. The Board does not recommend that such a complete and fully equipped institution be established immediately, for reasons given in reply to question (*f*).

The Board recommends that in the meantime, in order to provide for the efficient training of students of agriculture attending Victoria College, the Biological and Chemical Laboratories of the Agriculture Department should be transferred to Wallaceville, and that they and the existing Veterinary Laboratory and the proposed Dairy Research Laboratory should be made available for the instruction of students, to the mutual advantage of the students and the Department; further, that class-rooms and students' laboratories should be provided there for the purposes of the students' training.

The Board further recommends that the Ruakura Farm Training College be made available for co-operation with the Auckland University College in assisting in the provision of instructional facilities for students.

QUESTION (*b*).—What would be the probable number of students of the kind mentioned in (*a*) (i) that could be utilized in New Zealand after taking their degrees?

It was shown in evidence that while the number of agricultural instructors could be largely increased in the Departments of Education and Agriculture with advantages which would probably fully justify the additional expense, it was unlikely that the demand within and without the service for experts in agricultural science would for some years warrant a large output of qualified men. In Melbourne, for example, the total number of students in the agriculture degree course is about thirty, and the demand is so small that the Government has to guarantee positions in order to get students to take the course. In Sydney University the numbers are approximately the same. In America, on the other hand, as Professor Richardson, of Melbourne University, has pointed out, the Agricultural Colleges have flourished greatly during the last twenty years, after a history of forty years of failure. Apparently the American colleges became a success when

the farming community found itself compelled to take full advantage of scientific training made available to the individual farmer by the extension work of the colleges; and it may be doubted, in view of the experience of Melbourne and Sydney, and of America in its earlier development, whether such a condition yet obtains in this Dominion or is likely to arise for some years. In the meantime the evidence indicates that if ten graduates were turned out yearly when the arrangements suggested by the Board were in full working-order, this is about the maximum number that could be employed as teachers, instructors, or research workers. Some doubtless would be otherwise absorbed by the industries of the land, and there is a wide scope in New Zealand for the scientifically trained agriculturist.

With a view to encouraging students to proceed to a degree in agriculture, the Board is of opinion that as far as possible only men with a degree in agriculture should be appointed as teachers of agricultural science in schools or as field instructors. There is an insistent demand on behalf of the farmers for field instructors, and although it was stated in evidence that a man who had just obtained his degree was not in most cases immediately suited to the position, and that more experienced men were needed, yet it is felt by the Board that a University degree should be as essential for such teachers and instructors as matriculation is for entering the University. The young graduate in agriculture, like the young doctor who takes a position in a hospital by way of novitiate in his profession, must, however, serve his apprenticeship to the business of agriculture after providing himself with the essential intellectual equipment. While, therefore, sufficient employment hardly exists at present for ten new graduates per annum, we think that a demand would arise when Government Departments, Education Boards, and the public became educated to employing men who had taken degrees. Dr. Lotsy stated that in Holland the Doctors of Agriculture are chiefly engaged in farming, and no doubt in time the same would come to pass in New Zealand. He also stated that any teacher in primary or high schools who took the special teachers' diploma in agriculture was paid an additional salary whether he was engaged in teaching agriculture or other subjects, and that in consequence nearly all male teachers made it their business to get the diploma in agriculture. The Board thinks that a similar provision might well be made in New Zealand.

QUESTION (*a*).—What new agricultural training institutions are required . . . for the efficient training of (ii) students desirous of becoming farmers, well equipped with a knowledge of the principles of scientific agriculture as applied to the work of practical farming in all its branches?

The evidence showed that there is a desire among farmers to have more Farm Training Colleges established, but the number of students offering hitherto has not been sufficiently large to justify the establishment of many new institutions. It may perhaps be argued—and the fact that Lincoln College has a waiting-list supports this view—that the lack of prospective students is due to the lack of Farm Training Colleges, and that if more Farm Training Colleges were established they would become better known and more popular; but the Board, after careful inquiries, was inclined to think that the

number of students offering would increase rapidly if a shorter and more intensive course of instruction were adopted. The Board found that pupils spent about half the time in actual farming operations, but that, though there was no doubt as to the quality and adequacy of the instruction given, the work done differed in some essential conditions from that which had to be performed on an ordinary farm, with the result that the boys could not get enough practice under commercial conditions, as to skill, speed, and output, to justify the time spent in practical work on the farm.

As the capital invested in Ruakura Farm as a whole amounts to some £1,500 per student, it is clear that the cost of sufficient land and plant at a Farm Training College to enable the boys to train for practical work under conditions approximating to those of the ordinary farm would be prohibitive. The Board thinks that such a course would be otherwise impracticable, being of opinion that the boys must learn the business of farming under commercial conditions after leaving the Farm Training College. Holding this view, the Board is unable to recommend that boys should spend any large proportion of their time at a Farm Training College in actually performing farming operations. We consider, however, that for boys intending to become farmers a short preliminary course of instruction at a Farm Training College, in general occupying, for seasonal reasons, at least one complete year, and covering the operations, management, economics, &c., of farming, would be of considerable value, especially if it were followed up at intervals by short courses of instruction at the Farm Training College or elsewhere after the boy has gone to work on a farm.

The Board recommends that the work of Farm Training Colleges should be arranged so that—(1) The course should be shortened as much as possible; (2) the field-work should consist mainly of demonstrations of correct methods in farming and in the breeding and management of live-stock; (3) the laboratory and class work should occupy a considerably larger proportion of the time than it does at present. The course would then form a short intensive preparation for boys leaving school and intending to go farming.

The adoption of such a curriculum in Farm Training Colleges would enable these schools to deal with far larger numbers than would be possible under present conditions, so that the capital invested per student would be greatly reduced. The Board is decidedly of opinion that institutions such as Ruakura Farm Training College and Canterbury Agricultural College, to be of real value and to be capable of such expansion as will meet the needs of the Dominion, must be rearranged so as to take at least double the present number of students. As the students become available, provision for training should be increased. In the meantime we recommend that, in addition to the proposals regarding Hawke's Bay (referred to below), Penrose, near Masterton, should be developed into a Farm Training College, seeing that the farm and quarters sufficient to accommodate twenty-six students are already available. Local interest in the matter has been evidenced by the presentation of land and by a large deputation of farmers who met the Board at Penrose.

The question of the government of Farm Training Colleges was regarded by the Board as a matter of considerable importance. The management of Farm Training Colleges is in the hands of the Department of Agriculture, but as the Education Department has special experience of the education of young students we are of opinion that it should be associated in the management of these institutions, especially in connection with arranging the curriculum and the teaching staff. The Board therefore recommends that a Board of Governors for Farm Training Colleges be set up consisting of the Hon. Ministers of Agriculture and Education, one member of the Department of Education, one member of the Department of Agriculture, and three members of the Board of Agriculture, which would include the President. Local Advisory Boards of, say, three members should also be appointed in connection with each Farm Training College, to act in conjunction with the Principal of the College.

Smedley Estate.—The Smedley Estate, which was bequeathed by the late Josiah Howard to the State for the purpose of training in agriculture, consists of 7,000 acres, practically all in grass. It is situated about twenty-four miles from Waipawa, the nearest town on the railway. It is reached by a good road as far as Tikokino, but for some distance farther the road is indifferent for heavy traffic. Mr. Howard did not leave any clear statement as to his wishes how to assist education, but it is gathered from evidence that he thought the estate would itself be used to give the boys of poorer parents the opportunity of free education and experience in farming matters. The situation and character of the land, the Board thinks, preclude it from being used for this purpose. There are various estimates of what the land and stock are worth, but managed as at present it is bringing about £4,000 a year, and there is an accumulated fund of £17,000. Suggestions were made that the property should be sold or leased, and the money invested so as to provide an income to be spent on agricultural education. The Board, however, recommends as the wisest course that it should be continued as at present under the supervision of the Department of Agriculture. When it was taken over there were many improvements needed to put the estate in order, but to-day the estate and stock are well managed, and the income from the estate should be of great assistance to agricultural education in Hawke's Bay. In order to carry out the wishes of the testator a sum of £1,300 per annum should be allocated from the income, £1,000 for twenty-five bursaries of £40 each to enable Hawke's Bay lads exclusively to receive a training in agriculture, and the remainder for a scholarship or scholarships to enable a selected Hawke's Bay student or students to go to a University College to take a degree of B.Ag. If the whole of the £1,300 were not used in any year any balance should revert to the trust.

The Board further recommends that suitable land be procured for a Farm Training College in Hawke's Bay, to be developed as soon as the success of the other Farm Training Colleges demonstrates the need for such a college in Hawke's Bay; this land to be utilized as a demonstration farm in the meantime.

QUESTION (*c*).—How should such an institution or institutions be equipped as regards staff, laboratories, and farming-land?

As, in the opinion of the Board, the time has not arrived for the establishment of one great School of Agriculture of University rank, the questions of staff, laboratories, and farming-land were not specially considered. It was clear from the evidence of experts that a considerable staff of professors and lecturers would be required, involving an annual cost of at least £10,000 for teaching alone, in addition to the annual cost of hostels and farming-lands, which could hardly be expected to be self-supporting, at any rate in the early stages of development of the college.

As regards Farm Training Colleges, the Board makes the following recommendations:—

1. *Staff.*—The staff would consist of the following: The College Principal; an agricultural graduate for every thirty students; a farm overseer capable of teaching and demonstrating farm practice; skilled farm-workers specially selected so as to give instruction in farm handicrafts; a horticulturist; besides a domestic staff to deal with the management of the hostel.

2. *Equipment.*—The laboratory and class-room facilities should be sufficient to render the teaching as concrete as possible and to enable the proportion of time at present devoted to laboratory and class-room work to be largely increased in accordance with the Board's recommendations above.

3. *Farming-land.*—Having in mind the type of training which it thinks should be given at a Farm Training College, the Board considers that a large area of first-class land need not be used. Sufficient land to grow all necessary crops and carry enough live-stock to provide adequate facilities for practical demonstrations is all that the Board would regard as essential. For these purposes it is considered that 200 acres of first-class land, or its equivalent, would suffice.

4. *Curriculum.*—The Board recommends that the main subjects dealt with at Farm Training Colleges should be soils, fertilizers, crops, live-stock breeding and management, farm-management, farm economics, and horticulture.

Special emphasis was placed on the importance of sound training in connection with farm economics by many witnesses with wide experience in farming matters; while, as regards horticulture, the Board wishes to stress the opinion that no agricultural training would be complete without instruction in horticulture, and that therefore special provision should be made in Colleges of Agriculture and in Farm Training Colleges for this purpose. The Board is strongly of opinion that, apart altogether from its commercial importance and prospects, the æsthetic value of horticulture amply justifies its inclusion in the course of agriculture.

In regard to Ruakura Farm Training College, the Board, when inspecting the college and seeing the pupils at work, was impressed with the necessity for additional teaching facilities, and Mr. La Trobe was asked to go into the question and report to the Board. His report, which was endorsed by the Board, is appended, and the Board trusts that its recommendations will be agreed to.

QUESTION (*d*).—Where each or any of such institutions should be situated in order to serve most efficiently the present requirements of the Dominion as a whole?

The Board, being of opinion that the time has not yet arrived for the establishment of one great School of Agriculture, decided not to express a definite opinion as to the particular locality in which it should be situated, beyond recommending that it should be placed in a central position in New Zealand. Mr. G. L. Marshall dissented from this view, and defines his opinion in an addendum to this report.

As regards the location of Farm Training Colleges, the Board's recommendations are contained in the answer to question (*a*) (ii) above.

QUESTION (*e*).—To what extent, and under what conditions, could the Canterbury Agricultural College be utilized (subject to the approval of the Board of Governors) as an integral part of the general scheme?

The Board expressed the opinion that in order to be of real value and to be capable of such expansion as to meet the needs of the Dominion the vocational training must be rearranged so that the number of students completing their course each year should be at least doubled. This recommendation, while it referred mainly to Farm Training College students, assumed that degree students also would consume a much less proportion of their time at the college in actual farm-work than is the custom at present, and that accordingly more laboratory and class-room accommodation should be provided. The Board, having inspected Lincoln College and taken note of the investigational work in progress, especially in connection with plant-breeding (towards the cost of which the Department of Agriculture at present makes an annual grant of £500), is strongly of opinion that such work should be continued and expanded. The Board therefore recommends that an additional sum of £500 per annum be granted to Canterbury Agricultural College to enable it to continue and expand its plant-breeding and investigational work, and that a further sum be granted to provide a new laboratory and class-room for the accommodation of additional students.

QUESTION (*f*).—What estimated Government expenditure would be involved by giving effect to the Committee's recommendations regarding questions (*a*), (*c*), (*d*), and (*e*) above?

As in the opinion of the Board the time has not arrived for the establishment of one great School of Agriculture, the question of the cost has not been considered in detail, but from the evidence submitted by expert witnesses the Board estimated that it would be considerable, possibly involving a capital outlay of £250,000 for land, buildings, and equipment, besides a large annual expenditure for salaries, maintenance, and other incidentals. The Board recommends that when the number of students offering is sufficiently large this work should be undertaken.

In the meantime, if the Board's recommendations relative to the provision of class-rooms and laboratories at Wallaceville for the Victoria College agricultural students are carried out, we think that a sum of £15,000 would be required for this purpose, apart from

the expenditure which would be incurred by the Department of Agriculture in providing for the transfer of its Biological and Chemical Laboratories to Wallaceville.

As regards the needs of Canterbury Agricultural College, we are of opinion that a sum of £20,000 should be provided to bring it up to the standard of modern requirements, in accordance with the Board's recommendations above.

The question of expenditure in Auckland in the matter of laboratory buildings and equipment must remain for future consideration when the school is in existence.

As regards Farm Training Colleges, the immediate needs at Ruakura are dealt with in the special report furnished by Mr. La Trobe and appended hereto. The cost of the necessary buildings and equipment is estimated at £2,100.

At Penrose the necessary additional buildings immediately required are estimated to cost £7,000, the details of which will be provided later.

(To be concluded in next month's "Journal.")

TRIALS WITH ARTIFICIAL FARMYARD MANURE AT LINCOLN.

In the *Journal* for February last Mr. M. J. Scott, Chemist at Canterbury Agricultural College, Lincoln, gave an account of the making of artificial farmyard manure, and of a trial undertaken on mangolds, at the College farm during last season. Referring further to the matter, Mr. Scott supplied the following note under date 11th September, 1925:—

"We regret to have to report that the results of the trials with artificial farmyard manure on mangolds are inconclusive. Weighings for the manured plot on the south side of the control gave a decrease of 17 per cent., while on the north side there was an increase of 13 per cent. in favour of the manure. Both results are barely significant, and in the case of the lower figure the increase amounts to about 2·9 tons of roots per acre. Since the recent rain, when the south side of the paddock has been a sheet of water, we are convinced that this variation, which masks the effect of the manure, is due to seepage, throughout the year, to the lower end of the paddock. The season of 1924–25 was remarkable for very little rain till October, and for fairly heavy rain till the end of January. The absence of result is due to this unexpected inequality of the ground, to the fact that only one strip was taken in the paddock, and that the ridges went across this strip and made it necessary to take weighings on strips wide apart instead of on contiguous strips. This season we have replicated the plots in such a way as to be able to take weighings off plots that are side by side and evenly distributed all over the paddock. We have also included cattle-made dung in the trial. Results will be recorded in due course."

SEASONAL NOTES.

THE FARM.

FORAGE CROPS.

LAST month's notes on autumn and summer forage crops will be largely applicable to November in respect of sowings, especially having regard to the backward spring season experienced in most districts.

The sowing of rape will be in full swing next month, governed largely as to date by lamb-fattening requirements. A favourite practice in Canterbury, and one which usually gives excellent results for lambs, is to sow a mixture of rape and oats through alternate coulters of the drill, the rape at 1½ lb. to 2 lb. and the oats (either Duns or Algerians) at about 1 bushel per acre.

Sowing of the main turnip crop will be an important item of November farm practice in the South, though in districts subject to the depredations of the grass-grub beetle it may be considered advisable to somewhat delay the operation. The coming month is the recognized time for sowing the still essential swede crop in Southland and South Otago. In many parts the yield of swedes is only moderate, owing to lack of cultivation and insufficient manuring. A crop of 40 tons per acre on 10 acres is a much better proposition than a 20-ton crop on 20 acres. Endeavour should be made to produce a heavy crop on a restricted area rather than a poor crop on a larger area. A more generous application of fertilizers in the case of swedes seldom fails to show a satisfactory return.

Carrots like deep cultivation, and may be grown in a great variety of soils, but do best in a free loam. For cattle-feeding, Matchless White, White Belgian, and Sinclair's Champion are still the best among the standard varieties. Unfortunately, the last named appears to have deteriorated during the last few years, and generally does not produce the roots it used to. If a fair-sized area is to be put in carrots they should be sown in drills 21 in. to 26 in. apart, in order to allow of horse cultivation. If the area is small, and the cultivation to be done by hand, they may be grown in 14 in. to 18 in. drills. Seeding is at the rate of about 1 lb. per acre. Manures similar to those recommended for mangolds, at 3 cwt. to 5 cwt. per acre, will be found suitable. When carrots are being grown for sheep-feeding, the Guerande variety is best. These should be sown, for preference, in drills 21 in. to 26 in. apart, at the rate of 1½ lb. of seed per acre. They should be given intercultivation but not thinned. About the middle of November is the best time to sow this variety.

Maize may be sown when danger from frost is past. The Ninety-days variety is among the best for green feeding, seeded at from 1½ to 2 bushels per acre. The seed should be buried at least 1½ in., and guarded so far as possible against birds.

Japanese millet requires a sheltered position to give good returns, and should not be sown too early—any time after the middle of November in the warmer districts, and the first week in December in colder situations. Sow through every coulter of the drill 16 lb. to 20 lb. of seed, and manure with superphosphate at 2 cwt. to

3 cwt. per acre. To get the best from millet, feeding should start when the growth is 6 in. to 9 in. high, and the crop should be fed off in breaks. Treated thus it will give a number of feedings.

LUCERNE.

Areas intended to be sown in lucerne should be persistently cultivated, with a view to germinating as many weed-seeds as possible before sowing in November or December. A fine, firm seed-bed should be secured, and an application of 1 ton crushed limestone or 10 cwt. burnt lime per acre while working the land is advisable. The ground should not be ploughed again after liming. Inoculation, by spreading about 3 cwt. per acre of soil from a well-established stand, should not be neglected unless there is distinct evidence from previous sowings that it is unnecessary. This practice must be regarded as a very desirable guarantee of the presence of the essential organism. The distribution of the inoculated soil should be done on a dull day and be followed by a stroke of the harrows. An application of from 1 cwt. to 2 cwt. of superphosphate per acre at seeding has much to recommend it.

Young stands from previous autumn sowings will frequently be covered by annual weeds such as fat-hen, yarr, &c. This growth should be mown close to the ground before seeding of the weeds takes place, and the process may need to be repeated. If the lucerne is reasonably clean, however, it should be allowed to get well grown before being cut.

TEMPORARY PASTURES.

The present is a good time for the sowing of temporary pastures. A mixture of 30 lb. Italian or Western Wolths rye-grass and 5 lb. or 6 lb. cow-grass per acre, together with 2 cwt. of a good phosphatic fertilizer, will give a great yield for grazing or feeding out. In general, a spring-sown pasture has a higher clover content than an autumn-sown one.

MAIZE-GROWING FOR GRAIN.

Among the chief reasons for the falling-off in yield per acre of cob-maize in those districts where it has been grown for many years are the loss of soil-fertility, fouling of the land with weeds, and neglect in seed-selection. Generally maize is grown several years in succession, and the land is then sown in pasture, or, too often, left neglected till required for maize again. The result is a crop of weeds, and especially of twitch, the common species in the east-coast districts of Auckland Province being Indian doob.

For the purpose of helping to maintain soil-fertility, and at the same time smother out weeds on land that has been cropped for maize several years, there is nothing better than a spring sowing of oats and red clover, or oats and vetches, at the rate of 2 bushels of oats and 6 lb. to 10 lb. of red clover or 1 bushel of vetches per acre. This crop not only helps to smother out weeds, but after the oats are fed off or cut for hay or chaff the clover or vetches can be fed off, and eventually ploughed under preparatory to again cropping with maize. Such a crop ploughed under builds up the humus-supply, adds nitrogen to the soil, and assists in holding water, while at the same time preventing the growth of weeds.

But the phosphate and potash supply must also be kept up, and for this purpose artificial fertilizers pay handsomely on the maize crop. A mixture of six parts of superphosphate, three parts of Nauru rock phosphate, and one part of sulphate of potash, at the rate of 3 cwt. to 5 cwt. per acre, will be found excellent for heavy land, while the rock phosphate may be replaced by blood-and-bone on lighter soils. On light soils the objection to too much cultivation in the endeavour to rid the land of twitch is overcome to a large extent by the use of smother-crops between successive crops of maize.

After-cultivation of the growing maize with the horse-hoe must be frequent if it is to be effective in keeping down weeds, aerating the soil, and conserving moisture. Soon after planting, it is best to cultivate deeply to deal with weeds, but as the plants grow the danger of destroying lateral roots increases, and the cultivation must then be only 2 in. to 3 in. deep. This may be continued until tasselling begins. The 42 in. to 48 in. row, allowing of more and later cultivation, is favoured where dry conditions may be expected.

Careful and efficient selection of cobs for seed while the crop is still standing, together with an interchange of seed among farmers growing and selecting the same strain of a variety that has done well in the district and become acclimatized, will probably do more to raise the average yield than the haphazard introduction of new varieties from outside the district. Such varieties soon become cross-fertilized and lose identity unless kept away from all other maize.

THE SUMMER FALLOW.

In Canterbury and other districts with similar conditions November is probably the best month of the year for commencing the usual summer fallow of some portion of the farm in which twitch of various kinds is making its appearance. The plough seems to hold its own as the implement for this work. The objective to aim at is the exposure of the rhizomes of the twitch to the maximum weathering. This necessitates the ground being left as rough as possible, and the use of any implements such as harrows or disk harrows tending to produce a fineness of the surface is to be avoided.

The absolute desideratum is to keep the rhizomes (underground stems) endeavouring to produce leafage. So long as this state of things exists the plant is using up its store of food material. The appearance of the leaf marks the commencement of replenishment of food, and consequent rejuvenation. The cultivator should aim at producing conditions as near as possible to those described, and before greenness appears twitch-infested land should be given a cross-ploughing or rough grubbing to expose a fresh portion to the weather.

A successful summer fallow might well be followed by a sowing of rape or mustard, about February, for a green manurial crop. Any quick-growing crop cheap to sow will be an advantage, and although little is known of the economic aspect of green-manuring in this country, observations indicate that beneficial results are likely to be maintained for a considerable number of years.

FIELD DRAINAGE AND PASTURE-GROWTH.

The lack of efficient field drainage has been very apparent on many farms this year, and plans should be made to correct this fault in time for next season. The amount of moisture which has to be removed by evaporation in many cases in the early spring, before the soil can become sufficiently warm for good growth, is enormous, and while the stiffer and heavier soils remain undrained, just so long will it be necessary to submit to late growth and a consequent short season. The position may be eased somewhat by the provision of greater quantities of supplementary fodders to carry on later into spring, but the most profitable method is to encourage earlier spring grass by drainage, together with liming and top-dressing. —*Fields Division.*

THE ORCHARD.

SPRAYING FOR FUNGUS DISEASES.

WET-WEATHER conditions early in October mean that growers are seriously handicapped in the fight against black-spot at the cluster and pink stage of blossoming, and close watch will be needed during the setting-period for signs of the disease. It may be necessary to apply the subsequent sprays at closer intervals in an endeavour to combat infection, and possibly bordeaux may have to be resorted to on the harder varieties; 3–4-40 to 3–4 50 will be found the most useful mixture for pears and apples respectively. When again reverting to lime-sulphur care must be taken that the interval is not too close, and that weather conditions are very suitable at the time of application. Avoid spraying if rain is threatening, and also if very hot and windy, as scorching sometimes results under such conditions. It has been found satisfactory to use one of the non-caustic sulphur pastes following a bordeaux spray, and then reverting to the lime-sulphur again for the next spray. Where the usual lime-sulphur programme has been in use, continue with this spray at 1–100 plus the combination given in last month's notes where desired, or the straight-out sulphur pastes at increased strengths on the tender varieties.

Brown-rot is sure to be prevalent in stone-fruits owing to the bad weather during the blossoming-period, and careful attention must be given to this disease by spraying with lime-sulphur, 1–120, plus 4 lb. to 6 lb. of a sulphur paste, or self-boiled lime-sulphur, 8–8–50. As soon as possible after setting has taken place thinning of the fruit should be undertaken to remove affected and other surplus fruits, as it is found that fruits in clusters are the most affected. The diseased fruit and twigs removed should be destroyed as soon as gathered.

Spraying for other pests should be along the lines set out in former notes.

THINNING, PINCHING, ETC.

Stone-fruits will now be getting well set, and thinning should receive attention. Burbank and Evans Early plums are two varieties which it pays to thin heavily, more uniform ripening and greater size being secured, which returns good value for the time spent. Space peach and apricot fruits well, as size is enhanced and the loss by brown-rot minimized. The removal of blossoms from the new wood of all

apple-trees and from two-year-old wood, also from weakly trees, will assist growth.

The pinching of surplus and misplaced shoots can also be attended to at this time. As new grafts break into growth an inspection should be made and ties severed, but the coverings should not yet be removed. Pinch new growths on the stocks. It is not always advisable to remove all of them entirely at first on vigorous stocks. Be careful to save some of the well-placed shoots. If misses are obvious, these can be budded or grafted on to next season so as to balance the tree again.

The matter of support for overcropped and weakly trees should receive attention early. It is less damaging to the developing crop and also assists in cultivation. A system now rather favoured is to prop up the limbs into position, encircle the tree at the desired height with a galvanized wire of about 12 gauge, and then remove the props. On strong limbs where the pressure is greatest insert a buffer between the wire and limb. Pieces of discarded hose, split and slipped on the wire, are good for this purpose.

CULTIVATION.

The disk harrows should be used freely during the early part of the season. This implement chops the ground deeply and paves the way for the cultivator and harrows later on, when a fine mulch is the big factor in retention of moisture should the weather set in dry. Be careful to work the soil back to the roots of all trees from which it may have been washed during the winter and spring rains. Failure to do this is the cause of many trees being less robust than those more favoured. —*J. H. Thorp, Orchard Instructor, Nelson.*

CITRUS-CULTURE.

An endeavour should be made to secure a good cultivation as early as possible. Plough and cross-plough where this has not been done. Dig up all odd strips of land and area round trees, afterwards maintaining a good tilth by the use of the hoe under trees, and horse implements between the rows.

Sprays: Where, owing to the delayed condition of the trees, bordeaux has not been applied for verrucosis at petal-fall stage, this may still be done at 4–4–40 mixture, and a repeat spray of the same is advisable on trees which have been sprayed earlier in the season. Owing to the prolonged flowering-habit of the lemon-tree, two or more sprays are necessary to ensure reaching the bulk of the fruits at the correct stage.

Scales and thrips: In order to secure full control of these pests the following sprays are necessary throughout the season: Oil, 1–40, when the sap moves in the spring; oil, 1–40, late October; oil, 1–100, plus nicotine sulphate, 1–800, early December and late January; oil, 1–40, when the trees are in autumn growth—say, early April. Many growers are inclined to rely on oil in spring and autumn only, but the condition of trees proves that these two sprays are not sufficient, both thrips and young scales becoming established in the long interval. The 1–100 oil, plus nicotine, 1–800, will, however, satisfactorily deal with them.

Reworking: Nearly every grove contains one or two drone trees—trees which refuse to fruit or have other undesirable habits. These should be worked over to a better strain, which may be done by budding at this period. —*W. H. Rice, Orchard Instructor, Auckland.*

POULTRY-KEEPING.

LATE HATCHES WITH NATURAL MOTHER.

ALTHOUGH the correct season has now passed for hatching out chickens it is safe to assert that many poultry-keepers, especially those on a small scale, will be making their first attempt to secure chickens in order to replace at a later date the old unprofitable stock. In the majority of such cases the natural mother will be employed. This is in itself a distinct advantage as compared with cases where artificial means are adopted; nevertheless if the young birds are to develop into payable stock they must be given special attention from first to last.

In the first place, it is important to see that the hen is not troubled with vermin. A common cause of hens leaving their eggs just before they are on the point of hatching is because they are pestered beyond endurance with lice. Especially in cases where the coop has been previously used for cooping fowls it should be well cleaned, and every crack and crevice sprayed with a disinfectant to make sure that no red mite is present. The hen herself should be dusted with insect-powder before being placed on the eggs, in order to free her from vermin that live on the body. These precautions against parasitic life should be periodically repeated during the rearing stages; but the hen should not be powdered just after the chicks are hatched, as the powder may get into their eyes and blind them.

Every care must be taken to protect the hen and her brood against accidents. The coop should be both cat and rat proof. The nest should be arranged in such a way that when the baby chicks leave the nest they are able to get back. Many chicks are lost annually by getting into a deep water-vessel. This risk can be minimized by using a shallow tray, or, better still, a special fountain made for the purpose of watering chicks.

The coop should be well ventilated, as plenty of fresh air is an essential requirement for both the mother hen and her brood. In order that the young birds may have an opportunity of running on to fresh ground (a great essential for their welfare) the coop should be made in such a way that it can be conveniently moved on to fresh ground every few days. Do not forget that shade is specially demanded by the growing bird at this period of the year, while an abundance of green stuff and a regular supply of clean water are of equal importance.

LEG-WEAKNESS IN BROODER CHICKS.

Several inquiries have been received lately in regard to leg-weakness —generally as regards brooder chicks at from three to four weeks old. This trouble is usually the result of huddling, due in most cases to insufficient warmth being provided in the brooder. The young birds, feeling the greater need of warmth, will huddle together in corners, each one trying to secure an inside position, which is naturally the warmest. Thus with the constant pressure on the undeveloped legs they soon spread, and as a result an affected bird will present a wobbling walk in its endeavour to move about. Unless preventive measures are resorted to, a gradual loss of leg-power will take place, even although the bird appears to possess normal health in all other respects.

While an insufficient degree of heat is the first thing to induce huddling and consequent spreading of the legs, the latter trouble will be greatly intensified if the floor of the brooder is made of smooth boards, and especially if there is insufficient bedding-material thereon. The constant slipping on the smooth surface obviously soon tends towards an abnormal condition of the delicate legs. There is really no cure when a bird becomes badly affected, and very often the only satisfactory treatment is to destroy it. This is one of those many cases in connection with poultry-keeping where prevention is the only way of fighting the trouble. A comfortable degree of warmth in the brooder is the first essential, and then care must be taken to see that plenty of bedding-material is provided. Where the floor of the brooder is made of smooth boards a piece of single sacking the full size of the brooder should be neatly placed in it. This will give the chicks a foothold in the event of their huddling.

The successful rearing of chickens depends largely on the attention given to numerous details, the most important of which is to see that the degree of heat instinctively demanded is always available. Even the most modern makes of brooders are not foolproof. Unless the attendant is observant and regulates the heating and ventilation according to the requirements of the chicks, especially when extreme weather conditions prevail, failure in some way or other is almost certain to follow.

THIN-SHELLED EGGS.

The production of thin-shelled eggs is a common occurrence at this period of the year, when the great majority of the birds are giving a maximum egg-yield. This trouble is usually due to insufficient shell-forming material being supplied, or to the birds being overforced with rich foods, such as meat, milk, &c. As a preventive an ample supply of crushed sea-shell or broken burnt bone should be available to the birds at all times. If this does not bring about a desired improvement the only other safe course is to feed less of the forcing ration.

As to the method of supplying crushed shell, or, indeed, grit of any kind, some people make the mistake of providing these materials in a narrow receptacle into which the birds can merely put their heads. A much better plan is to place the material in a wide box, or even on the ground, so that the birds are given an opportunity of scratching it about and picking out the pieces they like best. Especially is this necessary where both gravel-grit and sea-shell are mixed together. It must be remembered that the laying bird will consume more than double the amount of shell in proportion to grit. Thus it will be readily seen that owing to the latter being in the way and the birds being unable to remove it, they may easily be prevented from securing the necessary egg-shell-forming material so much required by them, especially during the heavy-producing season. —*F. C. Brown, Chief Poultry Instructor.*

THE APIARY.

FEEDING AS A SAFEGUARD.

In many districts there is a distinct break in the honey-flow from the cessation of the willow and fruit bloom until the clover makes its appearance. It is during this period that the bees must be carefully

watched, not only to see that they are not dying of starvation, but also to provide for a sufficient increase in young bees which will develop into field workers by the time the main honey-flow arrives. Gently stimulative feeding is the best course to adopt at this period. The quantity of syrup fed will depend largely upon the strength of the hives. If feeding has to be resorted to, the sugar-syrup may be fed in a less concentrated form than that which is given in the autumn and spring months, the quantity of water being increased. A syrup fed in the proportion of one part of sugar to six of water is all that is required, and will be the means of keeping the colonies strong in brood and bees. The invariable rule should be observed to always feed in the evening and inside the hive.

VENTILATION.

No set time can be given for increasing the size of the hive-entrances, but the action of the bees should be noted. If in cases where the entrances were contracted in the autumn to prevent the intrusion of mice they have not been already widened, they should be attended to at once. Proper ventilation during the working season is an important item in bee-management, as it relieves large numbers of workers from the duty of fanning during the hot weather. In extreme cases it may be necessary to elevate the hive-body by placing 1 in. blocks between it and the bottom-board. This should be sufficient to meet all requirements.

SUPERING.

Preparations should now be well in hand for enlarging the hives. This may be done when the brood-chamber is getting full of bees, and the operation should be carried out in mild weather. Do not wait until the bees are cramped for room, but anticipate their wants and add supers when they are required. Where drawn-out combs are used, no trouble will be experienced in inducing the bees to enter the supers. It often happens that no combs are available, in which case sheets of foundation must be used; but the bees will not always take readily to these unless there is a good flow of honey coming in, and a little encouragement will have to be given to induce them to enter the supers when only foundation is used. Should the bees fail to start work in the supers, elevate one or two frames of honey from the brood-chambers, at the same time inserting in their place sheets of foundation from the super. Do not bring excluders into use at this season, as the bees will rarely work foundation in the supers when they are used. Much time is lost by this practice, and very little honey will be gathered.

STERILIZATION OF FOUL-BROOD COMBS.

Considerable interest is being manifested in the sterilization of infected combs by the use of formalin and alcohol, and although a certain amount of doubt exists in the minds of many beekeepers as to the value of the treatment, tests in the laboratory are conclusive. Before 1922, when the Hutzelman solution was announced, the practice followed was to melt up all combs from infected colonies. However, since formalin has proved a successful germicide—either with the use of alcohol or water—of foul-brood bacteria, its use may be beneficially applied to the sterilization of extracting-combs. In a recent report Professor D. H. Jones, Bacteriologist, Ontario Agricultural College, sums up his investigations as follows:—

The questions we wished to decide in the following experiments were—first, whether or not Hutzelman's claims could be substantiated; and, secondly, whether or not the use of water as a diluent could be substituted for alcohol with satisfactory results. Accordingly, combs were immersed for twenty-four and forty-eight hours respectively in various dilutions of formalin, alcohol dilutions of formalin, and Hutzelman's solution, after which cultures were made from the larval scales.

X Indicates growth *Bacillus larvae*. o Indicates no growth *Bacillus larvae*.

Disinfectant.	Combs immersed 24 Hours.						Combs immersed 48 Hours.					
	Cultures from Capped Cells.			Cultures from Uncapped Cells.			Cultures from Capped Cells.			Cultures from Uncapped Cells.		
	1	2	3	1	2	3	1	2	3	1	2	3
Formalin 100	o	o	o	o	o	o	o	o	o	o	o	o
,, 50, water 50.. ..	o	o	o	o	o	o	o	o	o	o	o	o
.. 25, ,, 75.. ..	o	o	o	o	o	o	o	o	o	o	o	o
.. 20, ,, 80.. ..	o	o	X	o	o	o	o	o	o	o	o	o
.. 15, .. 85.. ..	o	o	X	o	o	o	o	o	o	o	o	o
.. 10, .. 90.. ..	o	X	X	o	o	o	o	o	o	o	o	o
,, 50, alcohol 50.. ..	o	o	o	o	o	o	o	o	o	o	o	o
,, 20, ,, 80.. ..	o	o	o	o	o	o	o	o	o	o	o	o
Hutzelman's solution	o	o	X	o	o	o	o	o	o	o	o	o

It will be seen from the table that in the case of uncapped cells, after twenty-four hours' immersion in all dilutions of formalin used, the spores of *Bacillus larvae* were killed. In the case of the capped cells, however, a few of the spores were not killed in the length of time, either in the water dilutions or in the Hutzelman solution.

After forty-eight hours' immersion, however, all spores were killed in capped cells as well as uncapped cells. Thus in these experiments the water dilutions of formalin proved to be as effective as the alcohol solutions in destroying the spores of *B. larvae* as they occur in the scales of infected brood combs.

On removing the combs from the formalin dilutions, strong odour of formalin persisted on the combs for days. As this odour is strongly objectionable to bees, attempts were made to get rid of it. The method that gave the best results was washing the combs under the tap immediately on removal from the formalin. The combs should be held in a slanting position and passed backwards and forwards and from side to side under the free-flowing tap. In this way all traces of the formalin can readily and easily be removed, after which the combs are stood up to dry.

—E. A. Earp, Senior Apiary Instructor.

HORTICULTURE.

VEGETABLE-GROWING.

In the cooler districts the sowing of French and runner beans may now be made, also marrows and pumpkins. Sow lettuce thinly in drills where it may be allowed to complete its growth. Towards the middle of the month, in the warmer areas, sow broccoli and Brussels sprouts, and savoy cabbage a little later.

The half-hardy plants mentioned in last month's notes may now be set out in the cooler districts. Handle the young plants carefully, disturbing the roots as little as possible. Avoid as much as possible

stunted plants whose growth has been checked by crowding or being allowed to remain too long in the seed-boxes. Discard also plants that are "blind," or that in any way differ from the true type. Do not waste land and labour on putting out cull plants; such cannot be made to give a satisfactory crop. Neither be tempted to plant on land that is unprepared; much better is it to complete the preparation and plant a later crop.

During fine weather hoeing and cultivating the growing crops is of first importance. Too often weeds are allowed to grow large before they are dealt with; the successful grower destroys them before they are visible to the casual glance. These remarks apply to the potato crop, which should be harrowed, if necessary, before the plants are through the ground. As soon as the rows can be seen, put the horse or hand hoes through them; a clean crop is not only bigger, but more easily handled and harvested. Avoid deep cultivation near the plants; to disturb the tuber-bearing growths is to diminish the crop. Defer the final moulding till the plants commence to flower or begin to spread.

Rhubarb and Asparagus Beds.

With the commencement of the summer fruit and vegetable crops the cutting of rhubarb and asparagus should be stopped; and too often these beds are then forgotten. The former is allowed to be overrun with weeds, and the latter, closely planted on land moulded up (a method copied from a country of higher rainfall and heavy, stiff land), with a number of weak shoots only remaining, is allowed to dry out. On the lighter, friable soils of this warmer country this method is uncommercial, and even in private gardens is disappointing.

If the asparagus-beds are weak, cease cutting early and *leave a limited number of strong shoots to each crown.* Apply a good dressing of chemical fertilizers. If in doubt what to apply, make it 2 oz. blood-and-bone manure and 1 oz. nitrate of soda per square yard, and do not allow the beds to dry out during the summer. This should produce a strong growth that must be carefully protected, for it is only by allowing the plant to make a vigorous recovery that a full crop of young shoots of quality may be harvested in the next spring.

Areas in rhubarb should receive somewhat similar attention as soon as pulling ceases for the season. Hoe them well in bright, dry weather, and afterwards apply a dressing of fertilizers and encourage good stout growth, removing all flower-spikes as soon as they appear.

Tomatoes.

Under glass the tomato crop is setting fruit, and every care is needed to avoid anything likely to check the plants, such as houses allowed to become overheated of a morning before the ventilators are opened up, or overventilated on cold nights. Plants treated to extremes of moisture or drought are seriously checked, and show it by dropping their flowers or slow development of the fruit. Worse still, under the conditions of a lowered vitality, leaf-mould fungus and other diseases find an opportunity of becoming established in the absence of that best of all preventives—the natural vigour of the plant.

Towards the end of the month the bottom bunches will be approaching maturity. It is customary then to strip the lower leaves surrounding

the ripening bunch and spread a mulch over the surface of the ground. Should the crop promise to be of exceptional merit, carefully select a few of the best plants and mark them down for seed-bearing. For this purpose, of first importance is it that the plant be of good type and constitution; next, that it carry a reasonably large crop; and, further, that the fruit be of satisfactory shape, colour, and texture. Allow such fruit to become fully ripe on the plant, extract the seed, dry it, and *store the seed from each plant in separate envelopes.*

As stated above, the best preventive of disease is a sturdy, normal plant. Where fungus spraying has to be resorted to, bordeaux mixture, 3–4–50, is the best remedy. Some growers are having trouble with white fly with crops under glass. If taken in the early stages, tobacco spraying or fumigation will meet the case, but if the trouble is extensive sodium-cyanide fumigation may have to be applied. This trouble would be avoided if the house, when empty, was thoroughly cleaned up. Such an opportunity should never be missed after blights or disease of any kind have been present.

SMALL-FRUITS.

In the small-fruit section Cape gooseberries may be planted out. Passion-vines planted out this season will require frequent cultivation to keep down weeds and induce vigorous growth. Stop all laterals and concentrate the growth in the main leaders. Older plants are often pruned towards the end of the month, the fruiting-laterals being cut back, thus sacrificing the summer crop and augmenting the more valuable late crop.

The gooseberry and strawberry harvest will now be commencing. Instruction and close supervision of pickers will well repay the trouble. To clean up all fruit that is ready to be gathered and avoid picking that which is immature requires intelligent application. Strawberry losses from birds will be largely avoided if the picking is commenced in the early morning. Provide separate containers for jam fruit, and avoid as much as possible the necessity of rehandling these delicate berries.

TOBACCO.

Tobacco-growers will be busy putting out the young plants in prepared ground. In doing this every care that is taken to avoid checking the plants is well repaid. Watering the beds before lifting, placing the plants systematically in convenient trays, and keeping them in the shade until the time of planting are some of the considerations that are of value. Replace losses in the field as soon as they are observed, and keep the wheel or horse hoes busy maintaining a clean tilth. Good work of this kind now will minimize the more expensive hand hoeing required when the plants are too big to allow of the machines being used. Remember early planting and growth will ensure an early harvest, when the leaves may be harvested in better condition and curing is facilitated.

WEED-KILLING.

The drainage of yards and roads about the homestead is often interfered with by the growth of grass and weeds blocking water-tables and culverts. A liquid weed-killer sprayed on with a watering-can now while the growth is short will make an effective clearance. A well-tried recipe

is as follows: Place 1 lb. arsenic and 2 lb. caustic soda in a kerosene-tin nearly full of water. Leave it to stand for a few days, and the arsenic will be dissolved, when the mixture may be diluted to 20 or 40 gallons, according to the nature of the weeds to be destroyed. Needless to say, this mixture is poisonous and should be kept in a safe place, as also the utensils used, as they can never be satisfactorily washed and made safe for other purposes again.

LAWNS.

For those who still have weedy lawns to deal with the following recipe will be useful: Dissolve 1½ lb. sulphate of iron in 1 gallon of water. Apply with a watering-can through a fine rose or with a spray-pump. This quantity is sufficient for 20 square yards. It will kill soft weeds and brown the grass, but will not seriously injure it.

Lawns receive great benefit if rolled now when damp, an operation which can, of course, be carried to excess, especially where the grass is short and thin and the land heavy—a very rare occurrence, however. Rolling is of special benefit on light land at this season, and will contribute very materially in diminishing the ravages of the grass-grub.

—W. C. Hyde, Horticulturist.

RENAL CONGESTION IN LAMBS.

THIS is a trouble which annually causes a greater or lesser mortality among lambs, and is one which is brought about solely by overnutrition. It is generally the best lambs that are affected, and almost invariably they are single lambs. Twins, having to share the milk of their dam, run less risk of overnutrition and usually escape the trouble. The farmer rarely notices any symptoms prior to the death of the lamb, and his attention is generally drawn to the trouble by finding one or more of his best lambs dead in the paddock.

On making a post-mortem examination of a lamb that has died from this trouble it is found to be in extra good condition—in fact, plethoric—and the kidneys are congested and often in such a pulpy condition that they can hardly be removed.

This condition may occur in lambs when they are between four and eight weeks old, and when the trouble appears it is generally found best to castrate and tail the lambs, as the bleeding from these operations and the shock to the system usually give the animal a "setback," and in this way prevent a continuance of the mortality. Occasionally some lambs die even after these operations have been performed, but these will generally be found to be single ewe lambs in extra good condition upon which the simple operation of tailing has had little or no effect. The ewes and lambs should also be removed to poorer pasture so as to reduce the milk-supply to the lambs. Owners of breeding-ewes should keep this matter in view when the lambs are between three and eight weeks old, especially when they are doing well and the ewes are in extra good pasture for milk-production.

In regard to treatment for an affected lamb, some castor-oil could be given, but treatment is hardly worth while, as at that age and in this condition they soon succumb. The whole trouble is one which can be controlled by management.

—Live-stock Division.

Destruction of the Kea.—The subsidy of 5s. per beak which has been paid by the Agriculture Department for the destruction of the kea for some years past was continued during 1924–25. A total of 2,916 beaks were paid for, this representing a decrease of 1,107 on the previous year's figures.

ANSWERS TO INQUIRIES.

IN order to ensure reply to questions, correspondents must give their name and address, not necessarily for publication, but as a guarantee of good faith. Letters should be addressed to the Editor.

CALVING, ETC., OF DAIRY COWS.

A. B., Otorohanga :—

I am informed that in the case of a cow or heifer calving prematurely the afterbirth will not come away until the date when the cow should calve naturally. Is this so ? In the case of some cows it is impossible to remove the afterbirth without injuring or causing bleeding to take place, so I have had to resort to washing out with a very light solution of Condy's daily. Is the tying-on of a light weight likely to do good ? Regarding the washing-out of cows before being put to bull, do you consider Condy's crystals as effective as most of the proprietary preparations on the market ? If so, please give exact strength to use. Should the cow always be in season when washed out, or would such washing be of benefit at any time ?

The Live-stock Division :—

In the case of a cow or heifer calving prematurely the fœtal membranes are frequently retained. More especially is this observed after cases of abortion; but there is no truth in the statement that the membranes will not come away until the date when the cow should calve naturally. Speaking generally, it is not wise to interfere with a cow having retained membranes for at least a few days after calving. Manual extraction is not to be recommended, except when done by a person who understands the nature of the connection between the membranes and the womb. It must be carefully done, the hand being inserted and the membranes detached (unbuttoned) from the mushroom-like elevations (cotyledons) on the womb. Where this procedure is roughly performed it frequently leads to permanent injury to the womb, and perhaps sterility. In cases of retention the following drench will be found useful : Epsom salts, 12 oz. ; powdered ginger, 1 oz. ; carbonate of ammonia, 4 drams ; dissolved in 3 pints water in which 1 lb. treacle may also be dissolved. The womb should be washed out with a few gallons of solution of permanganate of potash—one small teaspoonful of the crystals to the gallon of water. This treatment is usually effective. The practice of hanging a weight on the membranes usually only ends in causing a portion to break away. Regarding the washing-out of cows before being put to the bull : This is a procedure only to be adopted when there is actual trouble existing, and it should not be indiscriminately carried out. The womb can be properly douched only when the cow is in season, as at other times the mouth of the womb is firmly closed. Potassium permanganate in the strength given is a safe and useful solution to use.

MAKING IRON-AMMONIUM CITRATE.

F. K. Walker, Paengaroa :—

Please give me instructions for making home-made citrate of iron for iron-hunger ("bush sickness") in cattle. As I have quantities of lemons it may be worth while making the citrate of iron on the farm.

The Chemist :—

For making iron-ammonium citrate from lemons the juice is expressed and the amount of citric acid determined by analysis. It is then digested with the required amount of freshly prepared ferric hydroxide, and finally the calculated quantity of ammonia is added. The strength of the solution is then found by analysis, as the acidity of different batches of lemons (and consequently the strength of the final solution) varies considerably. It is therefore hardly practriable to make the citrate in small quantities on the farm, unless one has the necessary technical knowledge and suitable apparatus for the work.

STRAWBERRY-GROWING.

"SMALL-FRUITS," Hastings :—

I should be pleased if you could give me any information with regard to the following: (1.) Is there any way of destroying grass-grubs in a strawberry-bed without harming the plants? (2.) What is the best manure for strawberry-plants, the soil where these are planted being fairly rich, with a sandy loam underneath? (3.) Can you recommend any particular kind of strawberry-plant for commercial use (apart from Melba) which has a good rich flavour, also where it is best obtainable?

The Horticulture Division :—

(1.) Nothing is known at present that is effective in destroying grass-grubs in a strawberry-bed without harming the plants. Beds on rather light soil usually suffer considerably from this trouble. (2.) You say nothing of the age or condition of the plants. The following may be tried if the plants have not had a dressing this season: Four parts bonemeal, three superphosphate, two muriate of potash. Apply 5 cwt. to 10 cwt. per acre, working it with the cultivator. This may be followed by a dressing of nitrate of soda, 1 cwt. per acre, when the plants are in bloom. (3.) If you are planting for commercial purposes it is wise to use such varieties as have been proved suitable to your soil and district. If you wish to try others besides Melba and Marguerite, a few Cresswell's Seedling, Phenomenal, and Duke of Edinburgh are suggested. The Auckland nurserymen can probably supply you if your local nurseries have sold out.

ERADICATION OF GORSE.

G. A. BRUCE, Waipu :—

I would feel obliged for any information as to the most effective way of eradicating gorse. The land is mostly ploughable, part river-flat and the rest clay subsoil. Which do you think would be best—to plough deeply so as to bury the gorse well under, or to plough shallow and then when it started to grow again plough it in deep?

The Fields Division :—

Eradication of gorse under the conditions stated may be effected by (1) destruction of plants growing on the area, (2) treatment of the soil, (3) cropping. Grub out the gorse-plants and heap up and burn as soon as the plants are dry enough. If the area is not too large and the gorse-growth not too dense, grub well under the ground. This will help to weaken the root and make subsequent treatment easier. Plough up the area and lime it at the rate of 10 cwt. to 15 cwt. per acre of ground limestone. Sow 3 bushels per acre of Algerian oats with 3 cwt. of superphosphate. This will have a smothering effect on the young gorse-plants. After this crop is taken off put the area into temporary pasture of Italian rye-grass and red clover—25 lb. of the former and 6 lb. of the latter per acre, together with 2 cwt. to 3 cwt. of super. Any young gorse-plants that may appear should be promptly grubbed out. Stocking, especially with sheep, will assist in getting rid of the gorse. Keeping the principle in mind of smothering the gorse after cultivation by cropping, you may suit your cropping to meet your farm requirements.

PIGS WITH NASAL CATARRH.

L. C. G., Matatoki :—

I have pigs which are suffering from nasal trouble. They have difficulty in breathing through the nose, make loud noises as when snoring, and on one occasion I saw bleeding. They developed this trouble during the winter, although their living-conditions were good. It does not affect their appetite, but they are doing poorly. I would be pleased if you can kindly diagnose and give me a remedy for the trouble.

The Live-stock Division :—

Your pigs are evidently affected with a form of nasal catarrh, which, because of the snuffling noise made in breathing, is often called "snuffles." Sneezing and

bleeding from the nose are also symptoms of the trouble. The condition is not commonly met with. It is attributed to cold, wet conditions causing chills. Sties not properly protected from prevailing winds, damp floors, &c., are contributing causes. With improvement in the condition of the pigs the trouble as a rule disappears. An endeavour should be made to build up the animals by extra nourishing diet. A little linseed-meal fed daily is useful. One ounce of cod-liver oil given to each pig, mixed in the feed twice daily, will be found beneficial.

BROADCASTING TURNIPS.

"BROADCASTING," South Norsewood :—

Will you please tell me if I can expect satisfactory results from broadcasting turnips with a hand broadcasting-machine; also the quantity of seed required per acre, and if it is best to broadcast the manure before or after sowing the seed?

The Fields Division :—

We cannot ordinarily recommend sowing turnips with a hand broadcasting-machine, although this has been successful on maiden country, free from weeds, and in good heart, before the advent of the turnip-ridger and the drill. For one thing it is difficult to make proper use of the fertilizer, which under broadcasting-conditions is not concentrated round the roots of the plants. Another point which should not be overlooked on long-established farming-lands is that weed-growth is encouraged through the inability to cultivate broadcast crops during the growing season. However, should you decide to broadcast, the seeding should be about 8 oz. per acre. Apply the fertilizer and harrow in prior to sowing the seed, which will subsequently be chain or brush harrowed.

PRECAUTIONS AGAINST CONTAGIOUS ABORTION IN CATTLE.

"WHATATUTU," Gisborne :—

During the past season the milking-cows on the station were troubled with abortion. They were treated with success. I wish to know if there is any danger of the disease being spread among the station herd by using the same bulls as for the milkers. The station herd (200) is Hereford, the milkers Jersey cross.

The Live-stock Division :—

There is certainly some risk of spreading abortion to the station herd by using the same bulls as for the milking-herd. Though the disease apparently yielded to treatment last season, yet it is almost certainly still present in latent form and liable to recrudescence during the present season. You are therefore advised to use separate bulls for the station cows. If you wish to use the bulls you have at present you would be well advised to take a blood-sample from each bull and post to the Officer in Charge, Veterinary Laboratory, Wallaceville, who will examine them and report to you whether or not they react to the abortion test. A small 1 oz. bottle will be sufficient for each sample. Sterilize the bottle, then make a small cut on the tail, fill the bottle, cork, and label with the name of bull.

THE "FLOWERING-CURRANT" AND CROSS-FERTILIZATION.

G. M. DAVIS, Raetihi :—

I have been told that if what is commonly called "flowering-currant" is grown in the vicinity of red- and black-currant bushes in a few years the fruit-yielding bushes will cease to bear, owing to cross-fertilization with the "flowering-currant." Kindly let me know if this is actually so.

The Horticulture Division :—

The theory stated regarding currant-bushes is interesting, but no evidence to support it has been met with. There are many reasons for the edible-currant bushes not cropping sometimes, but it is extremely doubtful if the vicinity of the "flowering-currant" is one of them.

THINNING A MACROCARPA-CYPRESS PLANTATION.

A. M., Gisborne :—

I have a plantation of macrocarpa, three years planted, and now 8 ft. to 12 ft. in height. The trees are 5 ft. apart. I wish to know at what size or height I should thin them out; and will the thinnings, if, say, 6 in. to 8 in. in diameter, be durable for posts?

The State Forest Service :—

A macrocarpa plantation planted at 5 ft. apart would probably require thinning at about eight to ten years after planting. This, of course, would depend on the growth made by the trees during the first years. A general rule which might be followed is to start thinning out the young trees when it is noticed that the crowns of certain trees are beginning to overtop and crowd out the less-vigorous-growing stems. At this stage it might be well to go through the plantation and remove those stems which appear to be getting suppressed, having in view that a gradual opening-up of the crop is to be aimed at, so that the main vigorous-growing trees will receive sufficient space and light to develop. As the habit of *Cupressus macrocarpa* is inclined to be somewhat branchy, this thinning should not be begun until the stems in the crop have commenced to clean each other up—until the lower branches have started to die off and a clean stem has been produced to a height of about 3 ft. to 4 ft. The object in growing a plantation for timber purposes is to stimulate a natural pruning in the crop, and this is produced by growing the trees in close formation in the early stages, so that a complete canopy is maintained and competition is produced amongst the trees of the crop. When this competition results in the suppression of a certain number of the trees the time is indicated for the controlled entrance of more light by means of a light thinning-out of the stands. With regard to the second query, macrocarpa thinnings make admirable temporary fencing-posts if allowed to season for a period of a few months after cutting, the durability period depending on the amount of heart-wood which had been formed by the stems.

BOVINE TUBERCULOSIS.

THE annual report of the Live-stock Division for 1924-25 refers to the incidence of this disease in the Dominion as follows:—

The number of cattle condemned for tuberculosis during the year by Stock Inspectors on clinical examination in the field was 4,881, the Inspectors being thorough and active in their work. The distribution of the condemned stock was: Auckland, 3,021; Wellington (including Taranaki, Hawke's Bay, Marlborough, and Nelson), 1,242; Canterbury-Westland, 408; Otago-Southland, 210. During the year considerable use was made of tuberculin for diagnostic purposes, and this is a very encouraging sign, as it has been recognized for many years as the most valuable and reliable agent for detecting tubercular animals which do not show definite clinical symptoms. It is being largely used in connection with cows supplying milk for human consumption, and every encouragement is given by the Department to extend it and make its use available to every owner by carrying out the test free of cost. In the results of the examination of carcases on slaughter at freezing-works and abattoirs the percentage of tubercular animals shows a slight decrease. The number of cattle (excluding calves) examined was 397,432, of which 5·41 per cent. were found to be affected in varying degrees, a considerable number only very slightly. The position of the Dominion as a whole in respect of bovine tuberculosis seems to show some improvement when all collateral circumstances are taken into consideration. Generally speaking, it is most prevalent in low-lying wet or swampy areas, particularly in the Auckland Province. Drainage and better farming methods, combined with careful inspection and the observance of all possible preventive measures, will, it is hoped, bring about improvements as time goes on. As regards swine tuberculosis, the position remains about the same as last year.

WEATHER RECORDS: SEPTEMBER, 1925.

Dominion Meteorological Office.

GENERAL SUMMARY.

THE weather during September was, on the whole, unsettled, bleak, and squally. Atmospheric pressure was below the average over the Dominion for nearly the whole of the month, and westerly disturbances predominated. Rainfall was therefore above the average in all parts with a westerly aspect, but deficient in most of the east-coast districts. There were several hard frosts in both Islands, and especially on the east coast of the South Island, which, however, experienced very trying weather between the 12th and 14th, when the barometer was highest in the South.

Stormy weather prevailed in most parts from the 3rd to the 8th, when there were some heavy falls of snow in the South Island. Weather conditions were also severe between the 19th and 27th, and the west-coast rivers were in high flood. Some rather severe hailstorms were reported, with occasional thunderstorms.

—*D. C. Bates, Director.*

RAINFALL FOR SEPTEMBER, 1925, AT REPRESENTATIVE STATIONS.

Station.	Total Fall.	Number of Wet Days.	Maximum Fall.	Average September Rainfall.
North Island.				
	Inches.		Inches.	Inches.
Kaitaia	4·64	17	0·94	4·75
Russell	4·70	16	2·08	3·42
Whangarei	5·46	24	1·46	4·88
Auckland	4·60	25	0·87	3·62
Hamilton	5·91	26	0·55	4·37
Kawhia	5·10	24	1·04	4·39
New Plymouth	8·66	27	1·73	5·08
Riversdale, Inglewood	14·85	26	1·78	9·48
Whangamomona	9·72	27	1·25	7·57
Tairua, Thames	5·60	16	1·40	4·64
Tauranga	3·87	20	0·80	4·21
Maraehako Station, Opotiki ..	2·95	12	0·76	4·28
Gisborne	1·63	8	0·50	3·11
Taupo	7·83	20	1·12	3·71
Napier	0·34	6	0·17	1·75
Maraekakaho Station, Hastings ..	0·70	13	0·17	2·58
Taihape	4·74	21	0·68	3·72
Masterton	4·28	17	0·57	3·18
Patea	6·00	25	0·95	3·63
Wanganui	4·88	12	0·75	3·05
Foxton	2·88	9	0·58	2·37
Wellington	3·32	19	0·75	4·03
South Island.				
Westport	7·73	29	0·95	6·82
Greymouth	13·41	27	1·33	8·26
Hokitika	14·01	27	1·38	9·14
Arthur's Pass	29·63	19	7·20	14·96
Okuru, Westland	18·67	18	2·87	12·48
Collingwood	14·76	24	1·52	10·13
Nelson	3·60	20	0·68	3·75
Spring Creek, Blenheim	3·17	18	0·69	2·64
Tophouse	16·69	24	2·56	4·81
Hanmer Springs	6·98	15	2·36	4·58
Highfield, Waiau	3·24	12	1·00	3·35
Gore Bay	2·26	8	0·68	4·28

RAINFALL FOR SEPTEMBER, 1925—*continued.*

Station.	Total Fall.	Number of Wet Days.	Maximum Fall.	Average September Rainfall.
South Island—continued.				
	Inches.		Inches.	Inches.
Christchurch	3·08	13	0·96	1·75
Timaru	2·08	11	0·54	2·18
Lambrook Station, Fairlie ..	4·50	9	1·98	2·30
Benmore Station, Omarama ..	2·40	17	0·46	2·14
Oamaru	1·59	8	0·79	1·74
Queenstown	3·39	15	0·75	2·52
Clyde	1·20	9	0·40	1·06
Dunedin	3·29	22	0·83	2·74
Wendon	2·64	19	0·52	2·44
Invercargill	5·28	25	1·22	3·00

AGRICULTURE DEPARTMENT'S FARMS AND EXPERIMENTAL AREAS.

FOLLOWING is a list of the farms, stations, and experimental areas at present operated by the Department, together with brief indications of their principal activities :—

Ruakura Farm of Instruction, Hamilton East : General farming and dairying. Stud-stock breeding (Milking Shorthorn, Jersey, and Ayrshire cattle ; Southdown sheep ; Berkshire pigs). Horticulture ; poultry ; apiary. Training-school for youths.

Central Development Farm, Weraroa, Levin : General farming and dairying. Stud-stock breeding (Friesian and Red Poll cattle ; Ryeland sheep ; Berkshire, Large White, and Large Black pigs).

Te Kauwhata Horticultural Station, Te Kauwhata, Lower Waikato : Vineyard and wine-making. Orchard. Black-wattle plantations and bark-mill.

Waimaunga Experimental Farm, Waimaunga, Grey Valley : Dairying ; pastures and crops.

Ashburton Experimental Farm, Ashburton : Cereals, potatoes, forages, and general crops. Lucerne growing and feeding. Soil-fertility-increase trials.

Mamaku Demonstration Farm, Mamaku, Rotorua County : Investigation of "bush sickness" (soil-deficiency affecting ruminant stock) ; dairying and auxiliary cropping.

Wallaceville Laboratory Farm, Wallaceville, Hutt Valley : Field-work in veterinary research. Wool-improvement. Breeding of milking-goats.

Puwera Experimental Area, Puwera, Whangarei : Gum-lands dairy-farming. Pasture-establishment and auxiliary crops.

Albany Experimental Area, Albany, Auckland : Gum-lands cultivation. Pasture plants and forages ; fruit-trees.

Marton Experimental Area, Marton : Cereals and general crops. Pasture-management.

Galloway Experimental Area, Galloway, Central Otago : Irrigation farming. Dairying ; lucerne-growing ; general cropping ; orchard-establishment.

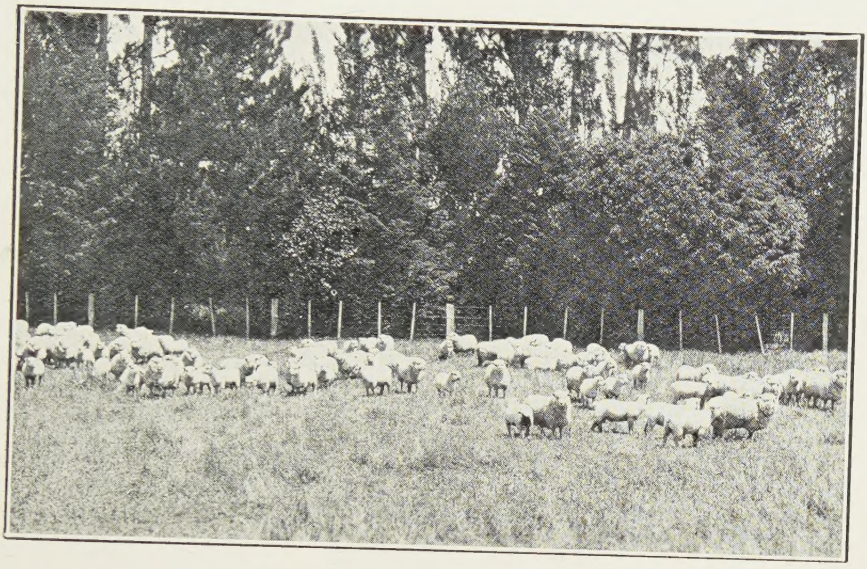
Gore Experimental Area, Gore : General cropping. Root-crop-diseases investigation.

Winton Experimental Area, Winton : Grassland economics ; general cropping.

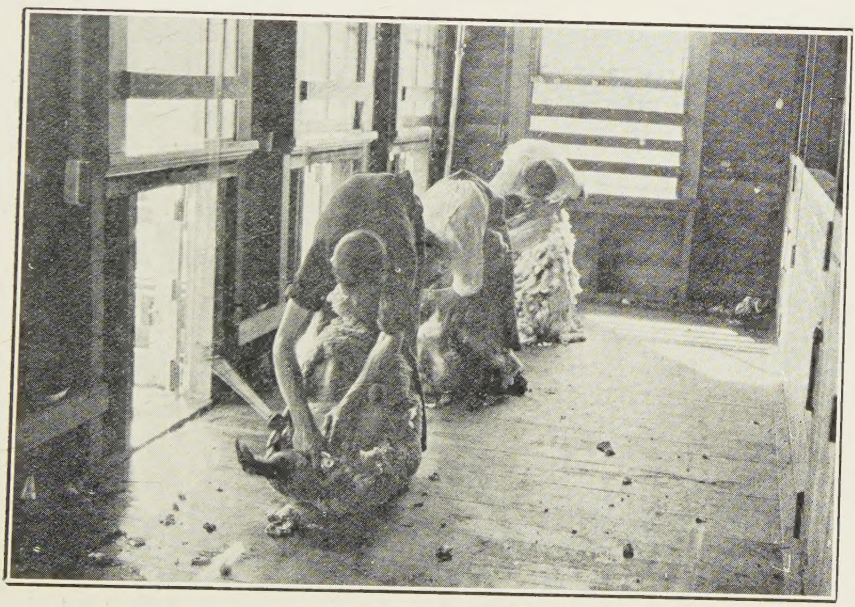
Quarantine Stations : Farming operations are conducted in connection with the live-stock quarantine stations at Motuihi Island (Auckland) and Quail Island (Lyttelton).

Undertakings under local ownership and management, but subsidized and superintended by the Department, comprise the Stratford and Waimate West Demonstration Farms in Taranaki, and the Northern Wairoa Experimental and Demonstration Farm, Dargaville.

A number of experimental plots are conducted by the Department in co-operation with local farmers in different parts of the Dominion.



SOUTHDOWNS AT RUAKURA FARM OF INSTRUCTION.



STUDENTS SHEARING AT RUAKURA.

ANNUAL SHEEP RETURNS AS AT 30TH APRIL, 1925.

TABLE I.—SUMMARY BY SHEEP DISTRICTS.

Class.	Auckland.	Napier-Gisborne.	Wellington-West Coast.	Marlborough-Nelson-Westland.	Canterbury-Kaikoura.	Otago (including Southland).	Total in Dominion.
Stud rams	580	756	3,686	1,180	4,043	2,155	12,400
Other rams	29,067	89,841	74,568	17,627	72,195	59,881	343,179
Wethers	315,461	663,618	680,410	210,572	547,586	646,016	3,063,663
Breeding-ewes	1,141,516	3,455,416	2,866,803	721,236	3,009,869	2,520,383	13,715,223
Dry ewes	61,775	274,029	200,074	40,622	167,652	139,614	883,766
Lambs	543,845	1,861,330	1,456,766	360,652	1,182,717	1,124,414	6,529,724
Totals, 1925	2,092,244	6,344,990	5,282,307	1,351,889	4,984,062	4,492,463	24,547,955
Totals, 1924	1,968,115	6,277,917	5,232,685	1,272,533	4,711,095	4,313,431	23,775,776

TABLE II.—COMPARATIVE STATEMENT: TEN YEARS, 1916-25.

Year.	Stud and Flock Rams.	Stud Breeding-ewes.	Stud Dry Ewes.	Stud Lambs.	Total Stud Sheep and Flock Rams.	Sheep of Distinctive Breed not entered in Flock-books, and Crossbred Sheep.				Grand Total, Stud and other Sheep.
						Wethers.	Breeding-ewes.	Dry Ewes.	Lambs.	
1916	316,131	252,201	15,012	175,155	758,499	3,478,263	12,640,566	1,189,023	6,721,799	24,788,150
1917	329,230	160,212	6,212	114,778	610,432	3,457,824	13,099,957	1,066,435	7,035,738	25,270,386
1918	325,111	171,437	6,297	125,116	627,961	3,696,520	12,850,597	1,592,452	7,770,772	26,538,302
1919	321,304	165,676	12,196	127,150	626,326	3,922,632	12,176,224	1,799,201	7,304,171	25,828,554
1920	306,621	154,516	9,803	109,454	580,394	3,901,742	11,415,159	1,814,391	6,208,284	23,919,970
1921	322,144	158,608	9,513	110,428	600,693	3,634,799	11,989,180	1,336,306	5,724,053	23,285,031
1922	322,072	154,277	7,259	98,221	581,829	2,727,624	12,341,777	952,789	5,618,240	22,222,259
1923	330,055	172,843	9,013	119,749	631,660	2,551,627	12,890,160	808,919	6,199,073	23,081,439
1924	332,814	179,533	9,727	132,137	654,211	2,807,832	12,896,561	1,036,723	6,381,249	23,775,776
1925	355,579	184,744	7,867	131,485	679,675	3,063,663	13,530,479	875,899	6,398,239	24,547,955

NOTE.—Stud sheep returned since 1917 are only those entered in flock-books.

TABLE III.—DISTRIBUTION OF THE VARIOUS BREEDS, AND OF CROSSBREDS, IN EACH SHEEP DISTRICT (1925).

Breed.	Auckland.	Napier-Gisborne.	Wellington-West Coast.	Total in North Island.	Marlborough-Nelson-Westland.	Canterbury-Kaikoura.	Otago.	Total in South Island.	Total in Dominion.
Stud sheep (entered in flock-books)—									
Merino	..	..	..	..	11,089	16,078	530	27,697	27,697
Lincoln	554	1,981	10,934	13,469	1,156	102	851	2,109	15,578
Romney	13,961	12,935	77,790	104,686	10,186	6,259	31,431	47,876	152,562
Border Leicester	314	..	394	708	312	11,325	11,424	23,061	23,769
English Leicester	511	375	255	1,141	1,114	18,706	484	20,304	21,445
Shropshire	444	..	662	1,106	198	2,905	605	3,708	4,814
Southdown	2,083	5,526	21,737	29,346	488	11,101	819	12,408	41,754
Corriedale	552	417	1,118	2,087	773	34,286	6,626	41,685	43,772
Other breeds	250	363	354	967	964	2,332	842	4,138	5,105
Totals	18,669	21,597	113,244	153,510	26,280	103,094	53,612	182,986	336,496
Sheep of a distinctive breed but not entered in flock-books—									
Merino	6,484	3,076	18,622	28,182	209,207	414,047	326,318	949,572	977,754
Lincoln	16,736	62,757	38,591	118,084	10,372	8,445	10,668	29,485	147,569
Romney	261,516	1,139,456	1,082,720	2,483,692	121,805	77,039	357,829	556,673	3,040,365
Border Leicester	5,010	6,837	3,088	14,935	424	26,682	54,799	81,905	96,840
English Leicester	2,907	1,085	698	4,690	8,178	43,988	4,366	56,532	61,222
Shropshire	3,627	95	1,058	4,780	1,756	5,445	2,390	9,591	14,371
Southdown	3,966	16,763	30,538	51,267	1,078	12,837	1,648	15,563	66,830
Corriedale	3,559	3,587	20,302	27,448	16,442	388,804	315,581	720,827	748,275
Half-breds	3,693	1,910	6,383	11,986	228,782	797,405	323,367	1,349,554	1,361,540
Other breeds	1,415	899	670	2,984	95	3,768	256	4,119	7,103
Totals	308,913	1,236,465	1,202,670	2,748,048	598,139	1,778,460	1,397,222	3,773,821	6,521,869
Crossbreds and others not otherwise enumerated	1,764,662	5,086,928	3,966,393	10,817,983	727,470	3,102,508	3,041,629	6,871,607	17,689,590
Grand totals	2,092,244	6,344,990	5,282,307	13,719,541	1,351,889	4,984,062	4,492,463	10,828,414	24,547,955

FORTHCOMING AGRICULTURAL SHOWS.

Hawke's Bay A. and P. Society: Tomoana, 21st and 22nd October, 1925.
Poverty Bay A. and P. Association: Gisborne, 27th and 28th October.
Wairarapa A. and P. Society: Carterton, 28th and 29th October.
Marlborough A. and P. Association: Blenheim, 28th and 29th October.
Timaru A. and P. Association: Timaru, 28th and 29th October.
Manawatu A. and P. Association: Palmerston North, 4th, 5th, and 6th November.
Ashburton A. and P. Association: Ashburton, 5th November.
Northern A. and P. Association: Rangiora, 6th November.
Canterbury A. and P. Association: **Royal Show,** Christchurch, 11th, 12th, and 13th November.
Wanganui Agricultural Association: Wanganui, 11th and 12th November.
Wallace A. and P. Association: Otautau, 18th November.
Waikato A. and P. Association: Hamilton, 18th and 19th November.
Egmont A. and P. Association: Hawera, 18th and 19th November.
Otago A. and P. Association: Dunedin, 18th and 19th November.
Stratford A. and P. Association: Stratford, 25th and 26th November.
North Otago A. and P. Association: Oamaru, 26th and 27th November.
Wyndham A. and P. Society: Wyndham, 4th December.
Auckland A. and P. Association: Auckland, 4th and 5th December.
Waipukurau A. and P. Association: Waipukurau, 22nd January, 1926.
Horowhenua A. and P. Association: Levin, 26th and 27th January.
Rodney Agricultural Society: Warkworth, 6th February.
Dannevirke A. and P. Association: Dannevirke, 10th and 11th February.
Pahiatua A. and P. Association: Pahiatua, 13th February.
Masterton A. and P. Association: Solway, 16th and 17th February.
King-country Central A. and P. Association: Te Kuiti, 18th February.
Northern Wairoa A. and P. Association: Mititai, 20th February.
Tauranga A. and P. Association: Tauranga, 26th February.
Franklin A. and P. Association: Pukekohe, 26th and 27th February.
Taranaki Metropolitan Agricultural Society: New Plymouth, 3rd and 4th March.
Mayfield A. and P. Association: Mayfield, 20th March.
Temuka and Geraldine A. and P. Association: Winchester, 25th March.
Methven A. and P. Association: Methven, 27th March.

Agricultural and Pastoral Association Secretaries are invited to supply dates and location of their shows for publication in the "Journal."

Poisoning of Stock.—The Chemist to the Agriculture Department reports that an unusual number of cases of poisoning or suspected poisoning of stock were dealt with during the official year 1924–25. Several cases of poisoning by sheep-dips came under notice. In one instance the use of too strong a solution of an arsenical sheep-dip as a wash for lice resulted in the death of five out of six valuable plough-horses. Difficulty has been experienced in dealing with many cases of suspected poisoning of stock, owing to senders forwarding inadequate samples, or samples not properly packed.

Cider.—The manufacture of cider is steadily extending, especially in the Nelson District, where a large quantity of low-grade apples which would otherwise be unsaleable is utilized for making this beverage. The quantity of cider made during the year 1924–25 is estimated as 45,000 gallons, valued at £11,250.

Hops Exports.—The quantities and values of hops exported from New Zealand during the last five years ended 31st March were as follows: 1921, 1,765 cwt., £19,201; 1922, 2,056 cwt., £18,054; 1923, 2,243 cwt., £21,153; 1924, 3,883 cwt., £27,615; 1925, 4,469 cwt., £31,112.

Rabbit Districts.—The constituting of the Rotongata Rabbit-proof Fencing District (Waipa County), for the purposes of the Rabbit Nuisance Act, has been gazetted.